DETERMINATION OF INFRARED OPTICAL CONSTANTS FOR SINGLE COMPONENT HYDROCARBON FUELS

by

MICHAEL ROBERT ANDERSON

A THESIS

Presented to the Faculty of the Graduate School of the

UNIVERSITY OF MISSOURI-ROLLA

In Partial Fulfillment of the Requirements for the Degree

MASTER OF SCIENCE IN MECHANICAL ENGINEERING

2000

Approved by

James A. Drallmeier,
Advisor

H. Frederick Nelson

Ralph W. Alexander, Jr.

ABSTRACT

The objective of this investigation was to develop an experiment that could determine the infrared optical constants of single component hydrocarbon fuels from 2-15 μm (5000 – 667 cm^{-1}). The optical constants to be determined were the Lambert coefficient of absorption and the real and imaginary parts of the complex index of refraction. The coefficient of absorption and the imaginary part of the index of refraction (extinction coefficient) were determined directly from transmittance measurements. The real part of the index of refraction (refractive index) was calculated using the absorption coefficient and Kramers-Kronig optical dispersion relations. Since Kramers-Kroning relations require knowledge of the absorption coefficient across the entire spectrum of frequencies (wave numbers 0 to ∞), assumptions about the behavior of the absorption coefficient were modeled from existing transmittance data outside the experimental region.

Optical constants were determined for nine single component liquid hydrocarbon fuels. The fuels investigated were: iso-octane, iso-pentane, n-heptane, n-hexane, n-nonane, n-decane, 1-hexene, o-xylene, and toluene. Because of the availability of accurate published data, water was used to validate the experimental set-up.

The determined absorption coefficient curve for iso-octane showed excellent agreement with the absorption coefficient curve produced from American Petroleum Institute (API) data. Additionally, the calculated value for the absorption coefficient and extinction coefficient for iso-octane at 3.39 μm (2950 cm^{-1}) is in very good agreement with existing results from reflectance measurements.

ACKNOWLEDGEMENT

First, I would like to thank my graduate advisor, Dr. James A. Drallmeier, for allowing me to be part of the Combustion and Fuel Spray Dynamics Research Group. He is greatly appreciated for the mentoring and the teaching that he provided during my time at the University of Missouri-Rolla. To the members of the Group, I thank you for your friendship and willingness to help. I wish to express a my appreciation to Robert Sutton and Kyle Koederitz for their assistance with the development of the data acquisition program used in the experiment and a special thanks for the invaluable friendship they provided. I would also like to thank Dr. Ralph Alexander and Dr. H.F. Nelson for serving on my committee and helping me to work through some of the difficulties that comes with experimental work.

The United States Army, the Army Corps of Engineers, and the Department of Physics and Nuclear Engineering, United States Military Academy, West Point, are acknowledged for providing me the fully funded opportunity to obtain a Master of Science degree. I would like to offer a special thanks to the machinists, technicians, and secretaries of the UMR Mechanical Engineering Department. Your advice, expertise, and skills greatly enhanced my learning environment.

Lastly, I would like to thank my wife, children and family for their love and support during this entire process. I dedicate this thesis to my dearest and closest friend, Carla, my wife.

TABLE OF CONTENTS

Page

Page

LIST OF FIGURES

Figure Page

Figure Page

LIST OF TABLES

NOMENCLATURE

N	complex index of refraction
n	real part of the complex index of refraction
$n(\omega)$	real part of the complex index of refraction at frequency, ω
$n(\omega_o)$	real part of the complex index of refraction at frequency, ω_o
$n(\omega_m)$	real part of the complex index of refraction at reference frequency, ω_m
$\Delta_{UV}n(\omega_o)$	contribution to the real part of the complex index of refraction from ultraviolet absorption
i	imaginary number
k	imaginary part of the complex index of refraction
$k(\omega)$	imaginary part of the complex index of refraction at frequency, ω
$k(\omega_o)$	imaginary part of the complex index of refraction at frequency, ω_o
ω	angular frequency in wave numbers, cm^{-1}
ω_m	reference angular frequency in wave numbers, cm^{-1}
ω_L	frequency at the start of the experimental data range
ω_U	frequency at the end of the experimental data range
ω_j	frequency at the jth experimental data point
ω_{j+1}	frequency at the j+1 experimental data point
ω_{j-1}	frequency at the j-1 experimental data point
α	Lambert Coefficient of Absorption
$\alpha(\omega)$	Lambert Coefficient of Absorption at frequency, ω
$\alpha(\omega_o)$	Lambert Coefficient of Absorption at frequency, ω_o
$\alpha(\omega_L)$	Lambert Coefficient of Absorption at frequency, ω_L

$\alpha(\omega_U)$	Lambert Coefficient of Absorption at frequency, ω_U
$\alpha(\omega_m)$	Lambert Coefficient of Absorption at some reference frequency, ω_m
$\alpha'(\omega)$	first derivative of the absorption data at frequency, ω
α_j	absorption coefficient at the frequency of the jth experimental data point
α_{j+1}	absorption coefficient at the frequency of the j+1 experimental data point
α_{j-1}	absorption coefficient at the frequency of the j-1 experimental data point
$I(\omega)$	radiant intensity at frequency ω through the sample filled cell
$I_o(\omega)$	radiant intensity at frequency ω through the empty cell
R_o	air-glass reflectance from the empty cell
R	fluid-glass reflectance from the filled cell
x	cell thickness
$T_{em}(\omega)$	experimentally measured transmittance at frequency, ω
λ	wavelength of light in μm (microns)
P	principal part of the Cauchy Integral
C	contour used in Cauchy Integral
C_1-C_4	contours one through four used in Cauchy Integral
c	speed of light
v	velocity
f(z)	arbitrary complex function
u(z)	real part of the complex function, f(z)
v(z)	imaginary part of the complex function, f(z)
$\Re[f(z)]$	real part of the complex function, f(z)
$\Im[f(z)]$	imaginary part of the complex function, f(z)

δ	displacement
nd	number of experimental data points
F_j	value of the integrand at data point j
F_{j+1}	value of the integrand at data point j+1
$r(\omega)$	complex reflection coefficient at frequency ω
$r(\omega_o)$	complex reflection coefficient at frequency ω_o
$r^*(\omega)$	complex conjugate of the complex reflection coefficient at frequency ω
$f^*(z)$	complex conjugate of the function, f(z)
$\theta_r(\omega)$	phase at frequency ω
$\theta_r(\omega_o)$	phase at frequency ω_o
$\theta_r(\omega_m)$	phase at frequency ω_m

1. INTRODUCTION

Infrared extinction is a current popular method for the quantitative measurement of fuel-vapor concentration in fuel sprays. These measurements yield a better understanding of fuel spray characteristics which will lead to improvements in fuel spray systems and improvements in the combustion process, e.g., better emissions control. Drallmeier [1, 2], Billings and Drallmeier [3], and Luke [4] have performed detailed investigations into the feasibility of using the infrared extinction technique as a non-intrusive means of analyzing fuel-vapor concentrations. Critical to the infrared extinction technique is the calculation of the fuel droplet optical thickness. Given the refractive index, Mie Scattering Theory will predict droplet cross-section at a given wavelength as a function of drop size. However, published data for the complex index of refraction of hydrocarbon fuels in the infrared is very limited. Drallmeier and Peters [5] determined the complex index of refraction for iso-octane, but that was done at one specific wavelength, 3.39 μm (2950 cm^{-1}). Alexander et al. [6] determined the complex index of refraction of liquid RP-1 rocket fuel at eight specific laser wavelengths varying from 0.193 μm (51813 cm^{-1}) to 10.5915 μm (944 cm^{-1}). Neither of these investigations determined optical properties over a continuous spectrum.

The goal of this investigation was to experimentally determine the complex index of refraction for nine single component hydrocarbon fuels over a broad infrared spectrum. Six paraffin (alkane), one olefin (alkene), and two aromatic (alkyl benzenes) hydrocarbon fuels were studied. These fuels were: paraffin; iso-pentane, C_5H_{12}, iso-octane, $C_8H_{18,}$, n-hexane, C_6H_{14}, n-heptane, $C_7H_{16,}$ n-nonane, C_9H_{20}, and n-decane, $C_{10}H_{22}$, olefin; 1-hexene, C_6H_{12}, and aromatic; toluene, C_7H_8, o-xylene, C_8H_{10}.

A review of current literature is presented in Section 2. Methods of determining the complex index of refraction for water and other substances were examined in this section. Section 2 also provides a detailed discussion on the derivation of the Kramers-Kronig optical dispersion relations used to determine the real and imaginary parts of the index of refraction. Additionally, the method for evaluating these dispersion relations is presented. A description of the experimental set-up used and procedure used is given in Section 3. Section 4 presents the validation of the experimental set-up. The results of the experiment using the hydrocarbon fuels are presented and discussed in Section 5. Conclusions and recommendations are made in Section 6. Appendix A is a listing of the computer codes used to implement the Kramers-Kronig relations to calculate the real part of the index of refraction and the codes used to acquire and reduce the experimental data. Appendix B contains the exact experimental procedure used and Appendix C contains the tables of the experimentally determined optical constants for each of the nine fuels.

2. LITERATURE REVIEW

2.1 METHODS OF DETERMINING INFRARED OPTICAL CONSTANTS

There are many different ways to experimentally determine optical constants of a substance in the infrared spectral region. These experimental methods require a variety of either transmittance and/or reflectance measurements in order to calculate the desired optical constant. The optical constants that are of most interest are the complex index of refraction, N, the real and imaginary parts of the index of refraction, n and k, and the Lambert Absorption Coefficient, α. The following relations define these constants:

$$N = n - ik \tag{1}$$

where i is an imaginary number that is defined as $i=\sqrt{-1}$ and

$$\alpha = \frac{4\pi k}{\lambda} \tag{2}$$

where λ is the wavelength of the light. Transmittance measurements are most commonly used to determine the imaginary part, k, of the index of refraction and the absorption coefficient, α. Transmittance and reflectance measurements can both be used to calculate the real part of the index of refraction.

Some researchers sought only to determine the optical properties of a substance at a specific wavelength. Drallmeier [5] used a two-angle reflection approach that measured the ratio of the parallel reflectance to the perpendicular reflectance to determine the index of refraction of iso-octane at 3.39 μm (2950 cm^{-1}). This approach is limited to spectral regions where the substance is strongly absorbing. The method will produce large errors in spectral region of small absorption, i.e., when the extinction coefficient (imaginary part of the index of refraction) is ≤ 0.01. Alexander et al. [6] employed four

different methods to determine the real part, n, of the index of refraction at eight different laser wavelengths. They used reflectance measurements, critical-angle measurements, Mueller matrix elements from scatterometer measurements, and Michelson interferometer measurements. A scatterometer was used instead of an ellipsometer since it determines all 16 elements of the Mueller matrix versus four by an ellipsometer. The investigators used these different methods because of the large changes of the extinction coefficient over the wavelengths investigated. The extinction coefficient, k, was determined from transmittance measurements using a spectrophotometer. The obvious disadvantages to this procedure are the number of different experimental setups and the inability to determine the optical constants over a broad spectral region.

In order to determine optical constants over a broad spectral region, transmittance and/or reflection measurements must be made over that broad region. A variety of mathematical methods can then be applied to the spectral data to determine the optical constants. The Optical Society of America organized a symposium in 1983 [7] to discuss various methods of determining optical constants of thin films. The panel of experts sought to determine the optical constants of two thin film materials all by different methods. The various panelists performed the measurements at seven different research laboratories and the results were compiled by Dobrowolski et al. [7]. Reflectance and transmittance measurements were made with a variety of spectrophotometers and ellipsometers. The investigators then used different iterative mathematical algorithms to converge on solutions for n and k. The spectral range was 400-900 nm (the visible to near infrared, NIR, range). Aside from many of the mathematical methods being quite complicated, some methods did not converge to a solution. The study highlights the

difficulty in determining optical constants over a broad spectrum and the inability of some reflection techniques to accurately determine the extinction coefficient.

Palik [8] and Macleod [9] describe some of the more popular techniques utilized to determine optical constants and the associated advantages and disadvantages of each. One method for determining optical constants for liquids over a broad spectral range is to utilize Kramers-Kronig optical dispersion relations to determine n and k from either transmittance or reflectance measurements. The Kramers-Kronig method was chosen for this investigation because 1) it provide accurate results over a broad spectral region that has both strong absorption and transmittance and 2) the mathematics behind the method is straightforward. Additionally, many different researchers have used this method to accurately determine optical constants of a variety of different substances. A large amount of experimental work on determining the optical constants of water using the Kramers-Kronig method has been performed. Further investigation into this research was made in order to develop an experimental setup that could use water as a test substance to validate the experiment.

2.2 DETERMINING OPTICAL CONSTANTS OF WATER

In 1968, Irvine and Pollack [10] completed an exhaustive review of to-date published optical properties of water and ice and critically examined the accuracy of the reported results. They did this because many of the reports had data that was extremely contradictory to each other. The largest uncertainties centered on the determination of the Lambert Absorption Coefficient, α, from experimental transmittance data. The absorption spectrum is generally found by measuring the transmittance through an empty

cell and then comparing it to the transmittance through a cell filled with a sample. The absorption coefficient is found from

$$(1-R_o)I_o(\omega) = (1-R)I(\omega)e^{(-\alpha x)} \quad (3)$$

where (1-R)I(ω) is the fraction of the radiation intensity transmitted through the cell at frequency, ω, x is the cell thickness and $(1-R_o)I_o$ is the intensity of the radiation through the empty cell. Most researchers assume $R_o = R$. This assumption is technically incorrect since the reflectance, R_o, of the air-glass boundary will differ from the reflectance of the sample-glass boundary, R. Irvine and Pollack [10] stated that since the difference between R and R_o is generally quite small, the induced error would make little difference. However, in regions where transmittance is near 100%, a small error in reflection loss can lead to a large error in the calculated absorption coefficient.

They also cited problems encountered when α is quite large, e.g., in the center of strong absorption bands. A very small cell thickness must be used. Errors can be introduced when the cell thickness is less than 10 μm. For example, curvature in the cell boundaries causes errors in the true determination of the cell thickness. A very small change in x can lead to a large change in α. They encouraged future investigators to use multiple thicknesses so that the transmittance values do not move too far toward either extreme (100% or 0% transmittance). Low transmittance is not bad, as long as it is measured accurately. Also, in regions of rapidly changing α as a function of wavelength, researchers must have sufficient spectral resolution. Multiple investigations [11-15] produced satisfactory results with a spectral resolution in wavenumbers of ≤ 10 cm^{-1}.

Draegert et al. [16], investigated the far-infrared spectrum of water using multiple cell materials to cover the range of 2.5-330 μm (4000-30.3 cm^{-1}). They developed a

logarithmic relation to determine α at various frequencies in order to account for the error in assuming the empty cell and filled cell reflectance is equal. Since the transmitted intensities are $(1-R_o)I_o(\omega)$ for the empty cell and $(1-R)I(\omega)$ for the filled cell (where R_o and R may not be equal because of reflections), the experimentally measured fractional transmittance, T_{em}, is given by

$$T_{em}(\omega) = \frac{[1-R]I(\omega)}{[1-R_o]I_o(\omega)} = e^{-\alpha(\omega)x} \tag{4}$$

as opposed to the true fractional transmittance which is just the ratio of the intensities. From this, the logarithmic relation

$$\ln T_{em}(\omega) = \ln\left[\frac{1-R}{1-R_o}\right] - \alpha(\omega)x \tag{5}$$

can be used to determine $\alpha(\omega)$ at various frequencies. Draegert et al. [16] determined $\alpha(\omega)$ from the slope of the $\ln T_{em}(\omega)$ versus x curve. The curve is a straight line produced from a least square fit of transmittance measurements of different thicknesses taken at the same frequency. The logarithm of the reflection ratios is given by the intercept of the line at x = 0. They found in most cases that the intercept was very small, thus, showing that the two reflections were nearly equal. However, they used the correction term to calculate the absorption coefficient.

Robertson and Williams [17] employed a similar technique as Draegert et al. [16] for determining the absorption coefficient of water in the range of 2.22-33.3 μm (4500 to 300 cm^{-1}). They used a variable length cell in a spectrophotometer to determine the transmittance. An equivalent method to Draegert et al. [16] is to determine the absorption coefficient from the ratio of the transmittances at two different cell thickness, x_1 and x_2.

$$\frac{T_2}{T_1} = e^{-\alpha(x_2 - x_1)} \tag{6}$$

This method will also eliminate the effect of the reflectance from the cell windows. This method is limited by the ability to establish and measure discreet differences in film thickness.

The imaginary part, k, of the index of refraction was calculated from equation (3),

$$k = \frac{\lambda\alpha}{4\pi} \tag{7}$$

after the absorption coefficient, α, was determined. Robertson and Williams [17] point out that equations (3) and (5) apply very strictly to a parallel beam moving through the sample cell. They used a non-parallel beam, but since the extreme rays of their convergent beam only made an eight-degree angle with the central ray, they ignored the small error induced into the cell path length.

Bertie et al. [11] used transmittance data to determine the absorptivity of ice in the frequency range of 2.5-333.3 μm (4000 to 30 cm^{-1}). In addition to calculating α and k, they employed a Kramers-Kronig optical dispersion relation to determine the real part, n, of the complex index of refraction. This relation is given by

$$n(\omega_o) = 1 + \frac{1}{2\pi^2} P\int_0^\infty \frac{\alpha(\omega) - \alpha(\omega_0)}{\omega^2 - \omega_o^2} d\omega. \tag{8}$$

A detailed analysis for the use of this equation is given in the next section. In order to use the Kramers-Kronig relationship, knowledge of the transmittance or reflectance across the entire spectrum, not just over the experimental range is required. When employing this technique, certain assumptions can be made to account for the spectrum outside of the experimental data range. In these regions, the absorption coefficient can be

assumed to be zero or a constant. Bertie et al. [11] showed that the Kramers-Kronig technique is relatively insensitive to either assumption, but that more error can be introduced when numerically integrating. These errors centered on regions where the absorption coefficient was rapidly changing. This error is greatly minimized if enough resolution is achieved between data points. All of these errors, however were insignificant compared to the error introduced by the experimental methods used in determining the absorption curve.

Palmer and Williams [18] determined the optical properties of water in the near infrared using both transmittance and reflectance measurements. They used cell path lengths that varied from 50 mm to 30 μm. In regions of strong absorption, i.e., frequencies below 4000 cm^{-1} (2.5 μm), the cells used in their investigation were too thick to accurately determine α. They recommended using smaller path lengths or employing other methods to determine the real and imaginary parts of the index of refraction in that region.

Rusk et al. [19] and Querry et al. [20] used reflectance measurements to determine the optical constants of water in the infrared. Both studies concluded that reflectance measurements provide an accurate determination of the real part of the index of refraction. In regions of strong absorption, reflectance measurements provide more accurate values of the imaginary part of the index of refraction. This conclusion was based on the difficulties in preparing extremely thin absorption cells and the capability to measure low transmittance values accurately. Both studies presented their results for water using values calculated from transmittance data (in areas of weak absorption) from previous investigations and reflectance data (in areas of strong absorption).

In 1975 Downing and Williams [12] published another comprehensive study of all previous work done in the field of determining the optical constants of water in the infrared. In a manner similar to Irvine and Pollack [10], they list the constants for water in the frequency range of 2-1000 μm (5000 to 10 cm^{-1}). In 1981, Segelstein [21] completed a comprehensive collection of the extinction coefficient of water in the frequency range of 10^{6} to 10^{-3} μm (10^{-3} to 10^{6} cm^{-1}). Because of the resolution in data points that was published by Downing and Williams [12], and the close agreement with Segelstein [21], their data is used as accepted values in this investigation. This data was also used to develop the computer code to calculate the real part of the index of refraction from the Kramers-Kronig optical dispersion relations.

2.3 KRAMERS-KRONIG OPTICAL DISPERSION RELATIONS

Before proceeding with a further review of existing literature on the determination of optical constants, a detailed derivation of the Kramers-Kronig optical dispersion relations is required. As stated in the preceding section, determining the Lambert Coefficient of Absorption and the imaginary part of the complex index of refraction from transmittance measurements is relatively straightforward using equations (3) – (7). Determining the real part of the index of refraction from the Kramers-Kronig dispersion relations is more complicated. In this section, the Kamers-Kronig relation for calculating the real part of the index of refraction from transmittance measurements is presented. Following this section, derivations of the Kramers-Kronig relations for reflectance measurements and the Subtractive Kramers-Kronig method for both transmittance and reflectance are made.

The following derivation of the Kramers-Kronig relations is taken from Arfken and Webber [22], Wooton [23] and work done by Tucker [24] and Newquist [25]. The term dispersion relation comes from optical dispersion, the fact that the index of refraction is dependent on the wavelength of light. In 1926-1927, Kramers and Kronig showed that the real part of the index of refraction could be expressed as an integral of the imaginary part.

Consider the function f(z), which is complex and analytic over the contour C, an infinite semi-circle, shown in Figure 2.1. In Figure 2.1, the x-axis is the real axis and the y-axis is the imaginary axis. If a function is analytic, it is differentiable at every point within the contour. The Cauchy Integral Theorem [26] states that for an analytic function, f(z)

$$\oint_C f(z)dz = 0 \tag{9}$$

where z is any point located on the interior of the closed contour, C. The rotation about the contour is assumed to be in the counter-clockwise direction. The Cauchy Integral Formula [26] states

$$f(z_o) = \frac{1}{2\pi i}\oint_C \frac{f(z)}{z - z_o}dz \tag{10}$$

where C is the closed contour about z_o and z is on C. If $f(z)/(z-z_o)$ is also analytic, then it is differentiable at every point except where $z = z_o$. In order to exclude this point, the contour, C_3 is used. Using the Cauchy Integral Theorem, the integral is

$$\left[\oint_{c_1}\frac{f(z)}{z - z_o}dz + \oint_{c_2}\frac{f(z)}{z - z_o}dz + \oint_{c_3}\frac{f(z)}{z - z_o}dz + \oint_{c_4}\frac{f(z)}{z - z_o}dz\right] = 0. \tag{11}$$

In order for the integral over the infinite semi-circle, C_1, to vanish, the following condition is applied

$$\lim_{|z|\to\infty}|f(z)| = 0 \qquad 0 \le \arg(z) \le \pi . \tag{12}$$

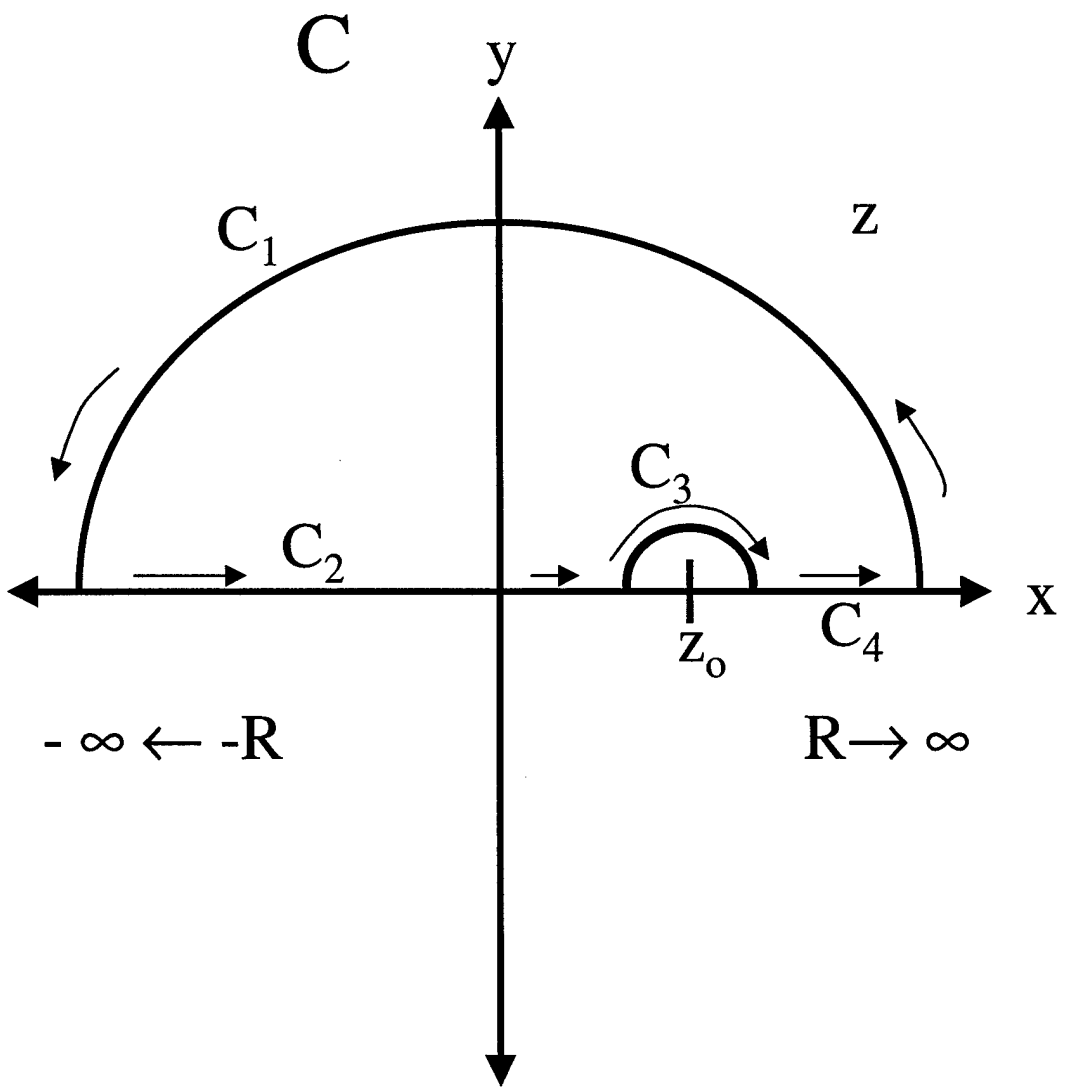

Figure 2.1 Contour C used for Kramers-Kronig derivation

Equation (11) now becomes

$$\left[\int_{-\infty}^{x-\delta}\frac{f(z)}{z-z_o}dz+\int_{x+\delta}^{\infty}\frac{f(z)}{z-z_o}dz\right]=-\oint_{C_3}\frac{f(z)}{z-z_o}dz \tag{12}$$

where δ is a small displacement on either side of z_o. Applying the Cauchy Integral Formula to contour C_3 yields

$$f(z_o)=-\frac{1}{\pi i}\oint_{C_3}\frac{f(z)}{z-z_o}dz. \tag{14}$$

This is only half of the value given by the Integral Formula since C_3 is a semi-circle. It is negative since the integral is taken in the clockwise direction, as indicated in Figure 2.1. Combining equations (13) and (14) yields

$$f(z_o)=\frac{1}{\pi i}\left[\int_{-\infty}^{x-\delta}\frac{f(z)}{z-z_o}dz+\int_{x+\delta}^{\infty}\frac{f(z)}{z-z_o}dz\right]. \tag{15}$$

As δ approaches zero

$$f(z_o)=\frac{1}{\pi i}P\int_{-\infty}^{\infty}\frac{f(z)}{z-z_o}dz \tag{16}$$

where P indicates the Cauchy principal value and is defined as

$$P\int_{-\infty}^{\infty}\frac{f(z)}{z-z_o}dz=\lim_{\delta\to\infty}\left(\int_{-\infty}^{x-\delta}\frac{f(z)}{z-z_o}dz+\int_{x+\delta}^{\infty}\frac{f(z)}{z-z_o}dz\right). \tag{17}$$

Splitting equation (16) into real and imaginary parts results in

$$f(z_o)=u(z_0)+iv(z_o)=\frac{1}{\pi}P\int_{-\infty}^{\infty}\frac{v(z)}{z-z_o}dz-\frac{i}{\pi}P\int_{-\infty}^{\infty}\frac{u(z)}{z-z_o}dz. \tag{18}$$

Equating real part to real part and imaginary part to imaginary part

$$u(z_0)=\frac{1}{\pi}P\int_{-\infty}^{\infty}\frac{v(z)}{z-z_o}dz \tag{19}$$

$$v(z_o) = -\frac{1}{\pi} P \int_{-\infty}^{\infty} \frac{u(z)}{z - z_o} dz \tag{20}$$

which are the dispersion relations. The real part of the complex function is expressed as an integral of the imaginary part and vice-versa. The real and imaginary parts are Hilbert transforms of each other.

In order to express the dispersion relations over positive values, crossing conditions must be used

$$f(-z) = f^*(z) \tag{21}$$

$$u(-z) + iv(-z) = u(z) - iv(z). \tag{22}$$

Equation (19) can be rewritten as

$$u(z_0) = \frac{1}{\pi} P \int_0^{\infty} \frac{v(z)}{z - z_o} dz + \frac{1}{\pi} P \int_0^{\infty} \frac{v(z)}{z - z_o} dz$$

$$= \frac{1}{\pi} P \left[\int_0^{\infty} \frac{v(-z)}{-z - z_o} dz + \int_0^{\infty} \frac{v(z)}{z - z_o} dz \right]$$

$$= \frac{1}{\pi} P \left[\int_0^{\infty} v(z) \left\{ \frac{1}{-z - z_o} + \frac{1}{z - z_o} \right\} dz \right]$$

$$u(z_0) = \frac{2}{\pi} P \int_0^{\infty} \frac{z v(z)}{z^2 - z_o^2} dz. \tag{23}$$

Similarly,

$$v(z_0) = -\frac{2}{\pi} P \int_0^{\infty} \frac{z_o u(z)}{z^2 - z_o^2} dz. \tag{24}$$

The original Kramers-Kronig optical dispersion relations were in the form of equations (23) and (24).

Dispersion relations for the index of refraction can now be written directly except that N does not satisfy the condition given in equation (12). Instead, as $\omega \to \infty$, the index of refraction, N, approaches unity. In order to satisfy the condition in equation (12), the complex function needs to be defined as

$$f(\omega) = N - 1. \tag{25}$$

The Kramers-Kronig optical dispersion relations now take the form of

$$\Re[N(\omega_o) - 1] = \frac{2}{\pi} P \int_0^\infty \frac{\omega}{\omega^2 - \omega_o^2} \Im[N(\omega) - 1] d\omega \tag{26}$$

$$\Im[N(\omega_o) - 1] = -\frac{2}{\pi} P \int_0^\infty \frac{\omega_o}{\omega^2 - \omega_o^2} \Re[N(\omega) - 1] d\omega. \tag{27}$$

Thus, the real part of the index of refraction at a particular frequency can be found if the absorption coefficient over the entire frequency range is known.

Evaluating equation (26) requires further manipulation. Rewriting equation (7) in terms of the frequency instead of wavelength,

$$k(\omega) = \frac{\alpha(\omega)}{4\pi\omega} \tag{28}$$

and substituting it into equation (26) results in the rewritten dispersion relation

$$n(\omega_o) = 1 + \frac{1}{2\pi^2} P \int_0^\infty \frac{\alpha(\omega)}{\omega^2 - \omega_o^2} d\omega. \tag{29}$$

In order to remove the singularity at $\omega = \omega_o$, the following term is subtracted from equation (29)

$$\frac{1}{2\pi^2} P \int_0^\infty \frac{\alpha(\omega_o)}{\omega^2 - \omega_o^2} d\omega.$$

This can be done because the term is equal to zero shown by the following,

$$\frac{\alpha(\omega_o)}{2\pi^2}P\int_0^\infty \frac{1}{\omega^2-\omega_o^2}d\omega = \frac{\alpha(\omega_o)}{2\pi^2}P\int_0^\infty \frac{-1}{\omega_o^2-\omega^2}d\omega. \tag{30}$$

Using integral tables [27] to evaluate the integral

$$= -\frac{\alpha(\omega_o)}{2\pi^2}\ln\left(\left|\frac{\omega_o+\omega}{\omega_o-\omega}\right|\right)_{\omega=0}^{\omega=\infty} = 0. \tag{31}$$

The term is subtracted and equation (29) is now written as

$$n(\omega_o) = 1+\frac{1}{2\pi^2}P\int_0^\infty \frac{\alpha(\omega)-\alpha(\omega_o)}{\omega^2-\omega_o^2}d\omega. \tag{32}$$

The integrand in equation (32) can be evaluated at the singularity, $\omega = \omega_o$, using L'Hopital's Rule:

$$\lim_{\omega\to\omega_o}\frac{\frac{d}{d\omega}[\alpha(\omega)-\alpha(\omega_o)]}{\frac{d}{d\omega}[\omega^2-\omega_o^2]} = \frac{\alpha'(\omega_o)}{2\omega_o}. \tag{33}$$

In order to evaluate equation (32), the absorption coefficient must be known over the entire spectrum. The integral is broken up into three regions. Region one is from $\omega = 0$ to $\omega = \omega_L$, from zero frequency to the frequency at start of the experimental data. Region two is $\omega = \omega_L$ to $\omega = \omega_U$, the experimental data range. Region three is $\omega = \omega_U$ to $\omega = \infty$, from the frequency at the end of the experimental data range to an infinite wave number. Region one and three are commonly referred to as the wing contributions. The process used for evaluating the wings is to assume that the absorption coefficient is either zero or a constant from the last known experimental data point. These assumptions can be made because of the nature of the denominator. At frequencies far from the frequency at which the calculation is made, the contribution is very small. The determination of $n(\omega_o)$ is most heavily influenced at frequencies closest to ω_o. Equation (32) is now written as

$$n(\omega_o) = 1 + \frac{1}{2\pi^2} P\left[\int_0^{\omega_L} \frac{\alpha(\omega) - \alpha(\omega_o)}{\omega^2 - \omega_o^2} d\omega + \int_{\omega_L}^{\omega_U} \frac{\alpha(\omega) - \alpha(\omega_o)}{\omega^2 - \omega_o^2} d\omega + \int_{\omega_U}^{\infty} \frac{\alpha(\omega) - \alpha(\omega_o)}{\omega^2 - \omega_o^2} d\omega \right]. \quad (34)$$

The first and third integral are evaluated analytically using integral tables and the second integral is evaluated numerically using the trapezoidal rule or another form of quadrature. A problem arises when evaluating the second integral at $\omega_o = \omega_L$ or ω_U. At these points the integral is undefined since the numerators are constants and the denominator is zero. Therefore, the limits have to be offset by a small δ in order for the frequency to fall outside the range of the experimental data. Equation (34) now becomes

$$n(\omega_o) = 1 + \frac{1}{2\pi^2} P\left[\begin{array}{l} \displaystyle\int_0^{\omega_L - \delta} \frac{\alpha(\omega) - \alpha(\omega_o)}{\omega^2 - \omega_o^2} d\omega + \\ \displaystyle\int_{\omega_L - \delta}^{\omega_L} \frac{\alpha(\omega) - \alpha(\omega_o)}{\omega^2 - \omega_o^2} d\omega + \\ \displaystyle\int_{\omega_L}^{\omega_U} \frac{\alpha(\omega) - \alpha(\omega_o)}{\omega^2 - \omega_o^2} d\omega + \\ \displaystyle\int_{\omega_U}^{\omega_U + \delta} \frac{\alpha(\omega) - \alpha(\omega_o)}{\omega^2 - \omega_o^2} d\omega + \\ \displaystyle\int_{\omega_U}^{\infty} \frac{\alpha(\omega) - \alpha(\omega_o)}{\omega^2 - \omega_o^2} d\omega \end{array} \right]. \quad (35)$$

For a small δ, the second and fourth integrals can be determined by multiplying the value of the integrand at ω_L and ω_U, respectively by δ.

The first and last integrals in equation (35) are evaluated analytically using the following formulas found in integration tables [27]:

For the assumption $\alpha(\omega) = 0$ outside the experimental data range,

$$\frac{1}{2\pi^2}\int_0^{\omega_L}\frac{-\alpha(\omega_o)}{\omega^2-\omega_o^2}d\omega=\frac{\alpha(\omega_o)}{4\pi^2\omega_o}\ln\left(\frac{\omega_o+\omega_L}{\omega_o-\omega_L}\right)\quad(\omega_o)^2>(\omega_L)^2 \tag{36}$$

$$\frac{1}{2\pi^2}\int_{\omega_U}^{\infty}\frac{-\alpha(\omega_o)}{\omega^2-\omega_o^2}d\omega=\frac{\alpha(\omega_o)}{4\pi^2\omega_o}\ln\left(\frac{\omega_U-\omega_o}{\omega_U+\omega_o}\right)\quad(\omega_U)^2>(\omega_o)^2. \tag{37}$$

For the assumption $\alpha(\omega)$ = constant outside the experimental data range,

$$\frac{1}{2\pi^2}\int_0^{\omega_L}\frac{\alpha(\omega)-\alpha(\omega_o)}{\omega^2-\omega_o^2}d\omega=\frac{\alpha(\omega)-\alpha(\omega_o)}{2\pi^2}\int_0^{\omega_L}\frac{1}{\omega^2-\omega_o^2}d\omega$$

$$=\frac{\alpha(\omega_o)-\alpha(\omega)}{2\pi^2}\int_0^{\omega_L}\frac{1}{\omega_o^2-\omega^2}d\omega$$

$$=\frac{\alpha(\omega_o)-\alpha(\omega_L)}{4\pi^2\omega_o}\ln\left(\frac{\omega_o+\omega_L}{\omega_o-\omega_L}\right)\quad(\omega_o)^2>(\omega_L)^2 \tag{38}$$

$$\frac{1}{2\pi^2}\int_{\omega_U}^{\infty}\frac{\alpha(\omega)-\alpha(\omega_o)}{\omega^2-\omega_o^2}d\omega=\frac{\alpha(\omega_U)-\alpha(\omega_o)}{4\pi^2\omega_o}\ln\left(\frac{\omega_U-\omega_o}{\omega_U+\omega_o}\right)\quad(\omega_U)^2>(\omega_o)^2. \tag{39}$$

The third integral term in equation (35) is evaluated numerically using the trapezoidal rule. This integral can be expressed as the summation of the trapezoidal areas

$$\frac{1}{2\pi^2}\int_{\omega_L-\delta}^{\omega_U+\delta}\frac{\alpha(\omega)-\alpha(\omega_o)}{\omega^2-\omega_o^2}d\omega=\frac{1}{2\pi^2}\sum_{j=1}^{nd}\frac{F_{(j+1)}+F_j}{2}(\omega_{(j+1)}-\omega_j) \tag{40}$$

where nd is the number of data points in the experimental data. F_j has singular points at $\omega = \omega_o$. At these points, L'Hopital's Rule is used and the integrand becomes

$$F_j=\frac{\alpha'(\omega)}{2\omega} \tag{41}$$

where $\alpha'(\omega)$ is the derivative of the absorption data at the point $\omega = \omega_o$. The derivative is evaluated using a central difference formula

$$\alpha'(\omega) = \frac{\alpha_{(j+1)} - \alpha_{(j-1)}}{\omega_{(j+1)} - \omega_{(j-1)}}. \tag{42}$$

If $\alpha'(\omega)$ has to be evaluated at the beginning or end of the experimental data, a forward difference or backward difference formula is used respectively.

$$\alpha'(\omega) = \frac{\alpha_{(j+1)} - \alpha_{(j)}}{\omega_{(j+1)} - \omega_{(j)}} \quad \text{forward difference} \tag{43}$$

$$\alpha'(\omega) = \frac{\alpha_{(j)} - \alpha_{(j-1)}}{\omega_{(j)} - \omega_{(j-1)}} \quad \text{backward difference} \tag{44}$$

The real part of the index of refraction can now be calculated. Appendix A contains a computer program to determine the real part of the index of refraction using the equations listed above.

2.4 KRAMERS-KRONIG RELATIONS FOR REFLECTANCE DATA

Reflectance measurements, instead of transmittance measurements, can be used to determine the real and imaginary parts of the index of refraction. This method can be used if the material is highly absorbing over the spectral region of interest. The reflectance, R, of normal incident light is defined by the Fresnel formula as

$$R = r(\omega)r^*(\omega) \tag{45}$$

where $r(\omega)$ is the complex reflection coefficient and is defined as

$$r(\omega) = \frac{(n - ik - 1)}{(n - ik + 1)} \tag{46}$$

and can be written in complex notation by

$$r(\omega) = |r(\omega)|e^{i\theta_r(\omega)} \tag{47}$$

where $|r(\omega)|$ is the complex reflectivity amplitude and $\theta_r(\omega)$ is the phase shift. This equation can be rewritten as

$$\ln[r(\omega)] = \ln|r(\omega)| + i\theta_r(\omega). \tag{48}$$

Since the $\ln[r(\omega)]$ is analytic over the contour interval as described earlier and approaches zero as $\omega \to \infty$, it can now be inserted into the dispersion relations given is equations (23) and (24). The Kramers-Kronig relations for reflectance take the form of

$$\ln|r(\omega_o)| = \frac{2}{\pi} P\int_0^\infty \frac{\omega\theta_r(\omega)}{\omega^2 - \omega_o^2} d\omega \tag{49}$$

$$\theta_r(\omega_0) = -\frac{2}{\pi} P\int_0^\infty \frac{\omega_o \ln|r(\omega)|}{\omega^2 - \omega_o^2} d\omega. \tag{50}$$

Applying the same procedure outlined in the above section, the singularity at ω_o can be removed from equation (50) and the relation takes the form of

$$\theta_r(\omega_0) = \frac{2\omega_o}{\pi} P\int_0^\infty \frac{\ln|r(\omega)/r(\omega_o)|}{\omega_o^2 - \omega^2} d\omega. \tag{51}$$

Equation (51) is evaluated in the same manner as outlined in section 2.3. With the phase shift known, the real and imaginary parts of the index of refraction can be calculated from the formulas

$$n(\omega_o) = \frac{1 - r^2(\omega_o)}{1 - 2r(\omega_o)\cos[\theta_r(\omega_o)] + r^2(\omega_o)} \tag{52}$$

$$k(\omega_o) = \frac{-2r(\omega_o)\sin[\theta_r(\omega_o)]}{1 - 2r(\omega_o)\cos[\theta_r(\omega_o)] + r^2(\omega_o)}. \tag{53}$$

Thus the real and imaginary parts of the complex index of refraction can be calculated from experimentally determined reflectance measurements. The reflectance, R, can be determined in a similar manner as the transmittance. From this measurement, $r(\omega)$ can be

calculated and then used in the Kramers-Kronig relation to determine the phase shift, $\theta_r(\omega)$. The equations work for measurements taken at normal or near normal incidence. For oblique angle measurements, some corrections to equation (51) must be made and can be found in the literature [19, 20, 28].

2.5 SUBTRACTIVE KRAMERS-KRONIG RELATIONS

The subtractive Kramers-Kronig method was developed in order to converge upon a solution more quickly and to develop a method that is not as sensitive to the assumptions or extrapolations made for the spectrum outside the experimental data range. The derivation of this method is taken from Ahrenkiel [29] and Tucker [24].

Assume that the real part of the index of refraction and the absorption coefficient is known at some frequency, ω_m, which is within the experimental spectral range. For example, the optical constants may have been determined by independent measurements. The Kramers-Kronig relation from equation (32) expresses this known value of the real part of the index of refraction as

$$n(\omega_m) = 1 + \frac{1}{2\pi^2} P\int_0^\infty \frac{\alpha(\omega) - \alpha(\omega_m)}{\omega^2 - \omega_m^2} d\omega . \tag{54}$$

Subtracting equation (54) from equation (30) yields

$$n(\omega_o) - n(\omega_m) = \frac{1}{2\pi^2} P\int_0^\infty \frac{\alpha(\omega) - \alpha(\omega_o)}{\omega^2 - \omega_o^2} d\omega - \frac{1}{2\pi^2} P\int_0^\infty \frac{\alpha(\omega) - \alpha(\omega_m)}{\omega^2 - \omega_m^2} d\omega \tag{55}$$

Simplifying,

$$n(\omega_o) = n(\omega_m) + \frac{1}{2\pi^2}\left\{ P\int_0^\infty \frac{\alpha(\omega) - \alpha(\omega_o)}{\omega^2 - \omega_o^2} d\omega - P\int_0^\infty \frac{\alpha(\omega) - \alpha(\omega_m)}{\omega^2 - \omega_m^2} d\omega \right\} \tag{56}$$

Thus, the real part of the index of refraction can be determined from experimentally determined absorption data and the optical properties of the substance at a known frequency.

Derived in a similar manner, the subtractive Kramers-Kronig relation to calculate the phase shift from reflectance data is

$$\theta_r(\omega_0) = \theta_r(\omega_m) + \frac{2\omega_o}{\pi} P\int_0^\infty \frac{\ln\left|r(\omega)/r(\omega_o)\right|}{\omega_o^2 - \omega^2} d\omega - \frac{2\omega_\phi}{\pi} P\int_0^\infty \frac{\ln\left|r(\omega)/r(\omega_m)\right|}{\omega_m^2 - \omega^2} d\omega \qquad (57)$$

This method will be less sensitive to assumptions made outside the experimental data range because of the subtraction term. However, a reference measurement used inside a large absorption band will produce significant errors since the subtraction term will now contain a numerator.

2.6 DETERMINING OPTICAL CONSTANTS OF SUBSTANCES OTHER THAN WATER USING KRAMERS-KRONIG RELATIONS

Several investigators have used the Kramers-Kronig relations outlined in the previous section to determine optical constants of materials other than water. Khanna et al. [30] determined the extinction coefficient, k, of crystalline C_2H_2 and C_4H_2 using transmittance measurements in the 2-50 μm (5000-200 cm^{-1}) range. They calculated the real part of the index of refraction using the Kramers-Kronig dispersion relation outlined in Section 2.3. Buffeteau and Desbat [31] developed a general method for determining optical constants of thin films deposited on substrates based upon reflectance and transmittance measurements. They used an iterative Newton-Raphson method to estimate the optical constants based on experimental data and then used Kramers-Kronig relations to improve the accuracy of the real part of the index of refraction.

Ghosal et al. [32] determined the refractive index of $CHBr_3$, CCl_4 and CS_2 in the 1-13 μm (10000 – 769 cm^{-1}) range. They used near normal reflectance measurements to calculate the real part of the index of refraction from the Fresnel relations given in equations (42-43). In areas of weak absorption (k very small), Fresnel's equations can provide accurate results. However, in areas of strong absorption, n and k were calculated from Kramers-Kronig relations for reflectance data. In their investigation, they validated their experiment using water and compared their results to Irvine and Pollack [10]. Their calculation of n using the Kramers-Kronig relations did not produce accurate results for water at the end of the experimental spectral region (11-13 μm (909-769 cm^{-1})). This error was caused by the extrapolation of the spectral data outside the experimental data range, which did not account for the increasing extinction coefficient.

Roux and Wood [14] and Wood and Roux [15] used transmittance data and the subtractive Kramers-Kronig relation to determine the optical constants of various thin cryofilms. They used ice to validate their experiment and their results compared favorably with Bertie et al. [11]. Their results for solid ammonia compared favorably with the investigation done by Robertson et al. [13]

Robertson et al. [13] used the subtractive Kramers-Kronig method to determine the real part of the index of refraction for solid ammonia. They outlined two reasons for using this method. First, they could not calculate the real part of the index of refraction directly using Fresnel relations since they did not take any reflectance measurements over the spectrum analyzed. Second, the subtractive method provides a more rapid convergence when data is only available over a limited range. Robertson et al. [13] showed that the calculated values of $n(\omega)$ were relatively unaffected by the assumptions

made about the absorption coefficient outside of the experimental data range. Their results were nearly the same for the assumption that $\alpha(\omega)$ was constant outside the data range or that it gradually decreased to zero.

Palmer et al. [33] developed a multiply subtractive Kramers-Kronig method to determine the optical constants of a material. This improved the subtractive Kramers-Kronig method. The advantage of this method is that it provides accurate results over a small experimental data range. However, multiple independently determined reference points are required. The optimum number of points is dependent upon the size of the experimental data range and the location of these points can affect the accuracy of the determined optical constants. The largest errors occurred when a reference point from a strong absorption band was used.

Tucker [24] employed the subtractive Kramers-Kronig relation to determine n and k for B_2O_3. Utilizing reflectance and transmittance data from previous researchers, he calculated the index of refraction in the 2-25 μm (5000-400 cm^{-1}) range. Newquist [25] used the Kramers-Kronig relations to determine n and k from reflectance data. Both used a technique that slightly differed from previous researchers in evaluating the Kramers-Kronig integral numerically. The integral can be evaluated everywhere except at the singular point where $\omega_o = \omega$, making the integrand undefined. These researchers utilized L'Hopital's Rule to evaluate the integrand at that point (as outlined in section 2.3). This method appears more straightforward than using a quadratic assumption (Downing and Williams [13]) or assuming the integrand is zero at that point (Bertie et al. [11]).

After carefully reviewing the literature, an experiment involving transmittance measurements was designed to directly calculate the absorption coefficient and extinction

coefficient. The real part of the index of refraction is then determined using the Kramers-Kronig relation given in equation (30). This was chosen over reflectance measurements because reflectance measurements do not produce accurate values for the extinction coefficient except in regions of strong absorption. Transmittance measurements could achieve accurate results in strong absorption areas with a small enough cell thickness. The subtractive Kramers-Kronig method could not be used since no independently determined values of n and k near the experimental data range have been determined for the fuels in the investigation (see next section).

2.7 INFRARED SPECTRAL DATA ON HYDROCARBON FUELS

The number of previous studies on the optical constants of hydrocarbon fuels in the infrared is limited [5, 6]. Spectral data from suppliers of spectrophotometric grade chemicals, such as Aldrich, is purely qualitative, intended for chemical composition identification. Published quantitative spectral data is limited. The American Petroleum Institute (API) Report Number 44 [34-57] is a collection of hydrocarbon infrared and ultraviolet spectral data that was generated in the late 1940's and early 1950's. Table 2.1 shows the ranges of the spectral data that was available from API. This is a collection of independent reports submitted by various different research laboratories. Of the nine fuels presented in this thesis, some sort of spectral data was available on each one except for iso-Pentane. The spectral data for the other fuels showed transmittance spectra mostly in the range of 2 –15 μm (5000-667 cm^{-1}). In the ultraviolet range, only data for 1-hexene, toluene and o-xylene was available. These reports qualitatively determined areas of strong absorption, however, no further calculations of the absorption coefficient

or the real and imaginary parts of the index of refraction were ever made. The reports do indicate sample thickness and show the spectral curves measures at various sample thickness.

The absorption bands in the fuels arise from the different types of bond structures between the hydrogen and carbon atoms. At certain energy frequencies, the bonds will stretch, deform/bend, or vibrate. Table 2.2 shows the frequencies at which the paraffin fuels exhibit absorption. Table 2.3 and 2.4 show the absorption bands specific to the olefin and aromatic fuels used in the study, respectively. However, absorption bands for the olefin and aromatic fuels can also occur in regions listed for the paraffin fuels if they contain the noted bond structure. This information was extracted from Bellamy [58] and the API reports [34-57].

The strongest absorption band for the paraffin fuels occurred due to stretching of the carbon-hydrogen bond. Of all the paraffin fuels, only a report for iso-octane was found in the spectral range of 15 – 25 μm (667-400 cm^{-1}). No significant absorption bands are present in this region.

The olefin, 1-hexene, has its strongest absorption due to carbon-hydrogen stretching, though the absorption is not as strong as the paraffin's. An equally strong band occurs at the low-end frequency range due to bond bending. In the ultraviolet region, an absorption band appears past 48,000 cm^{-1} (0.208 μm).

The strongest absorption band for the aromatics is caused by carbon-hydrogen bond bending amongst the free hydrogen atoms around the benzene ring. Because of molecular structure, the aromatic's absorption band near 3000 cm^{-1} was the weakest

Table 2.1 Available fuel spectral data

Carbon Number	Fuel	Formula	Refractive Index[1]	Infrared Spectrum (cm^{-1})	Ultra-Violet Spectrum (cm^{-1})
Paraffin C_nH_{2n+2}	Iso-Pentane	C_5H_{12}	1.35373		
	Iso-Octane	C_8H_{18}	1.40422	5000-400	
	n-Hexane	C_6H_{14}	1.37486	5000-667	
	n-Heptane	C_7H_{16}	1.38764	5000-667	
	n-Nonane	C_9H_{20}	1.40542	5000-400	
	n-Decane	$C_{10}H_{22}$	1.41189	5000-667	
Olefin C_nH_{2n}	1-Hexene	C_6H_{12}	1.38788	5000-400	
Aromatic C_nH_{2n-6}	Toluene	C_7H_8	1.49693	5000-667	46000-33000
	o-Xylene	C_8H_{10}	1.50545	5000-667	58000-33000

[1]Refractive index at 20 °C and are for the sodium D line, wavelength 5892.6 Angstrom units (16970 cm^{-1})

amongst all of the fuels at this frequency. In the ultraviolet region, a strong absorption band is present at 38,000 cm^{-1} (0.263 μm) for both aromatics.

Pure saturated hydrocarbons, e.g., the paraffin fuels, do not absorb in the ultraviolet region and are therefore sometimes used as solvents to mix with absorbing species to measure their spectra. This was the case in the API reports for the olefin and aromatic fuels, which were diluted in iso-octane. The double bonds found between carbon atoms in the olefin and aromatic fuels are responsible for the absorption in the ultraviolet region. Information about hydrocarbon ultraviolet absorption was taken from Clark et al. [59].

Table 2.2 Paraffin Absorption Band Locations

Type	Molecular Group	Frequency (cm^{-1})
CH Stretching	CH_3	2962 and 2872 ± 10
	CH_2	2926 and 2853 ± 10
CH Deformation	$C\text{-}CH_3$	1450 ± 20
	$\text{-}CH_2\text{-}$	1465 ± 20
	$C\text{-}CH_3$	1380-1370
	$\text{-}C\text{-}(CH_3)_2$	1385-1380 and 1370-1365
	$\text{-}C\text{-}(CH_3)_3$	1395-1385 and 1365
CH Skeletal Vibrations	$(CH_3)_2\text{-}C\text{-}$	1170-1140
	$\text{-}(CH_2)_4\text{-}$	750-720

Table 2.3 Olefin Specific Absorption Bands

Type	Molecular Group	Frequency (cm^{-1})
C=C Stretching	C=C	1680-1620
CH Stretching	-CH=CH-	3040-3010
	$CH{=}CH_2$	3040-3010 and 3095-3075
CH Deformation	-CH=CH-	970-960
	$CH{=}CH_2$	995-985, 915-890, 1856-1800 and 1420-1410
UV Absorption	C=C	48,000

Table 2.4 Aromatic Specific Absorption Bands

Type	Molecular Group	Frequency (cm^{-1})
CH Stretching	=C-H	3030-3010
CH Deformation	5 adjacent free H	770-730 and 710-690
	4 adjacent free H	770-735
Skeletal Ring Vibrations	benzene ring	1400-1600
UV Absorption	C=C	38,000

3. EXPERIMENTAL SET-UP

Figure 3.1 illustrates the experimental set-up. The experiment was designed with several factors involved. Factors such as, spectral range, resolution, ease of alignment, and repeatability were balanced by overall cost. Spectroscopy systems still remain quite expensive and thus a simple grating instrument experiment was designed to provide spectral data in the approximate range of 2.5-15.0 μm (4000-667 cm^{-1}).

An Oriel infrared monochromator illuminator provided a broad spectral bandwidth infrared beam. A mirror inside the illuminator housing focused the beam to match the acceptance cone of the monochromator. An Oriel 1/8 m Ebert-Fastie design monochromator grated the infrared beam. Three gratings were used to cover the spectral region in the experiment. Before entering the monochromator, the beam passed through a filter wheel with short wavelength cut-off filters to block higher order wavelengths from passing through to the detector. The beam was collimated leaving the monochromator by a lens made from Amorphous Material Transmitting Infrared Radiation (AMTIR). The sample cell was a Fourier Transform InfraRed (FTIR) demountable transmittance cell from Pike Technologies. The windows in the cell were made of zinc selenide (ZnSe). Multiple thicknesses were achieved by interchanging an assortment of teflon spacers that ranged from 0.015 mm to 1.0 mm. The fuels were entered into the sample cell via a syringe. The fuels were all spectrophotometric grade from the Aldrich Chemical Company. After the data was collected, the cell was evacuated with a vacuum pump.

A ZnSe lens collected the radiation passing through the sample cell and focused it onto the active area of the infrared detector. The detector used was an Electro-Optical

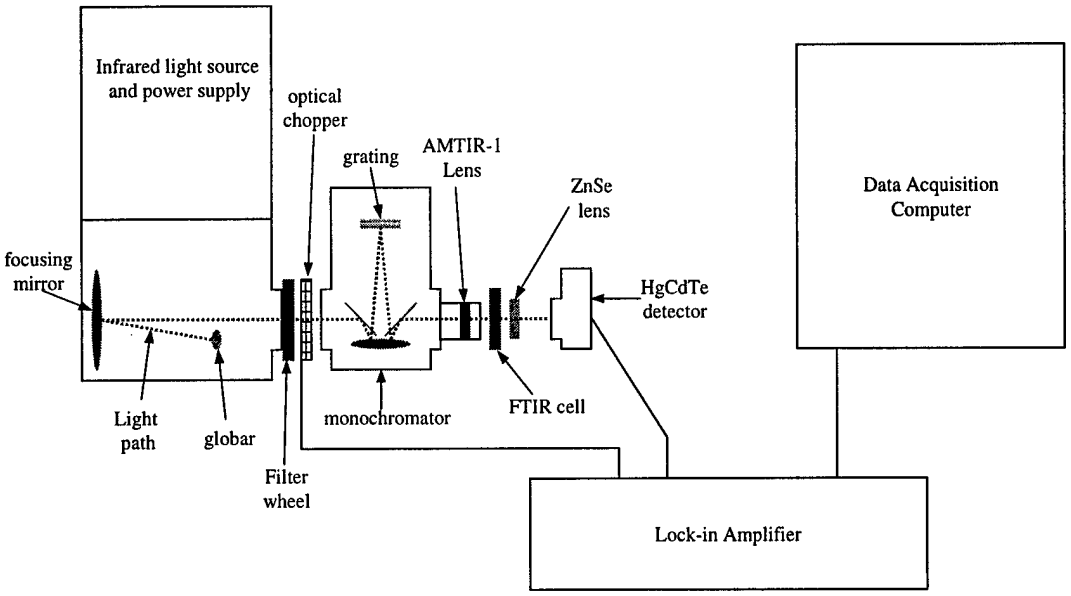

Figure 3.1 Schematic of experimental set-up

Systems Mercury-Cadmium-Telluride (HgCdTe) cryogenically operated photo-detector. The detector was cooled to 77 K with liquid nitrogen and had an active area of one square millimeter. A signal pre-amplifier was integrated into the photo-detector housing. The detector fed the signal into an EG&G Judson lock-in amplifier. A 100 Hz optical chopper, placed at the opening of the filter wheel attached to the infrared illuminator housing, provided the reference signal for the lock-in amplifier. Data was collected via a computer data acquisition system connected to the lock-in amplifier. The signal-sampling rate was 10 samples per second. The signal was time averaged over a three-second period for each wavelength. The entire set-up was mounted on an optics table.

The resolution and bandwidth of the monochromator was dependent upon the particular grating in the monochromator. In order to maximize signal intensity, the entrance and exit openings of the monochromator were set at their maximum, 3.0 mm. From the 2.5-5 μm (4000-2000 cm^{-1}) range, data points were collected every eight

nanometers (nm) with a bandwidth of ± 78 nm. In the 5-9 μm (2000-1111 cm^{-1}) range, data was taken at 16 nm intervals with a bandwidth of ± 158 nm. In the 9-15 μm (1111-667 cm^{-1}) range, data was taken at 24 nm intervals with a bandwidth of ± 236 nm. The wavelength size of the sampling interval was small enough to achieve a frequency interval of ≤ 10 cm^{-1} throughout the experimental data range.

Because of the narrow absorption bands found in hydrocarbon fuels, the bandwidth was reduced. For the range of 2.5-5.4 μm (4000-1852 cm^{-1}), the entrance and exit openings were reduced to one millimeter. This produced a bandwidth of ± 26 nm. In order to maintain the same bandwidth from 5.4-10.4 μm (1852-962 cm^{-1}) with the second grating, the size of the openings was further reduced to 0.5 mm. In order to use the third grating, which has a higher reflectance past 10.4 μm (962 cm^{-1}) than the second grating, the monochromator openings would have to be even further reduced. This produced an unacceptable signal to noise ratio. In order to maintain an acceptable signal to noise ratio from 10.4-14 μm (962-714 cm^{-1}), the second grating was used and the size of the openings were increased to one millimeter, resulting in a bandwidth of ± 52 nm. The sampling interval was every eight nanometers from 2.5-5.4 μm (4000-1852 cm^{-1}) and every 16 nm from 5.4-14.4 μm (1852-714 cm^{-1}).

The reduction of bandwidth significantly reduces the intensity of the infrared beam. The energy reaching the detector is proportional to the square of the width of either the entrance or exit opening [60]. The exit and entrance slits were kept at equal widths and were adjusted in order to achieve the smallest bandwidth (resolution) possible and still maintain an acceptable signal to noise ratio. The experimental range was reduced from 15 μm to 14 μm (667 cm^{-1} to 714 cm^{-1}) because the intensity of the

radiation could not produce an acceptable signal to noise ratio to counter the affect of the CO_2 absorption band located at 14.98 μm (668 cm^{-1}) [60].

Spectral data was collected first on the empty cell. The measured intensity was the value above the average background noise that was measured before and after the scan. Background noise was measured by blocking the exit aperture from the filter wheel. The cell was then removed from the holder, filled, and replaced into the holder. The scan was then completed and background noise measured as indicated previously. After scanning the filled cell, it was emptied, taken apart, cleaned, and reassembled with a different thickness spacer.

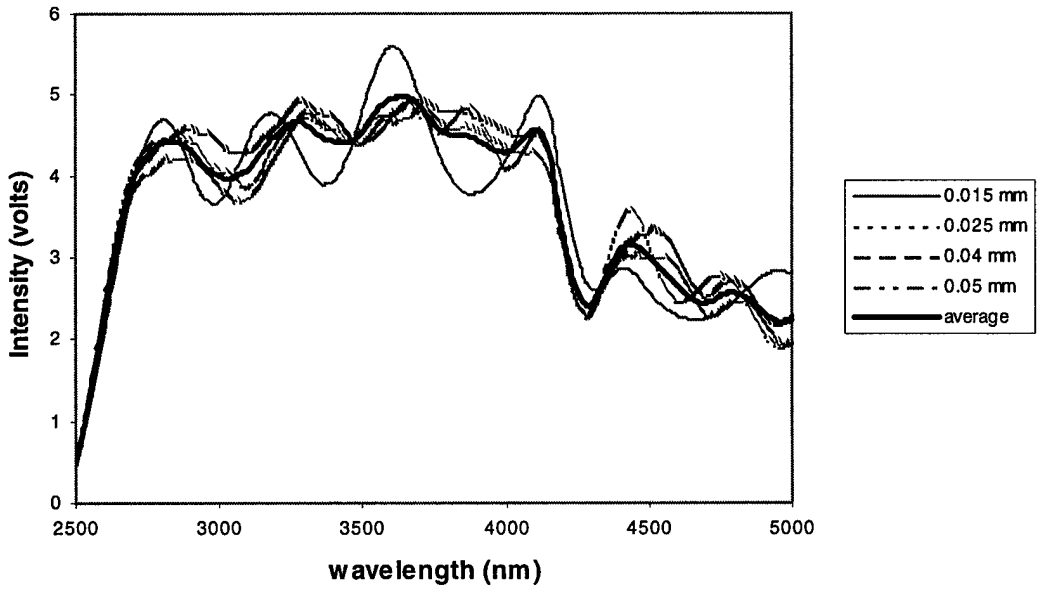

Figure 3.2 Interference pattern observed in intensity measurements on empty cells of small thickness

A constructive and destructive interference pattern was present in empty cell measurements of cell thickness less than 0.05 mm. Figure 3.2 shows the typical interference pattern seen from empty cell measurements. In cell thickness above 0.05 mm, the interference pattern is greatly reduced and the fluctuations in radiation intensity are due to reflectance efficiencies and Wood's anomalies of the monochromator gratings, atmospheric absorption bands (CO_2 at 4.25 μm (2353 cm^{-1})) [60], and transmittance properties of the lenses and filters. Figure 3.3 shows the intensity from several empty thick cell measurements. The interference pattern is caused by the large difference between the index of refraction of air and the index of refraction of the ZnSe windows.

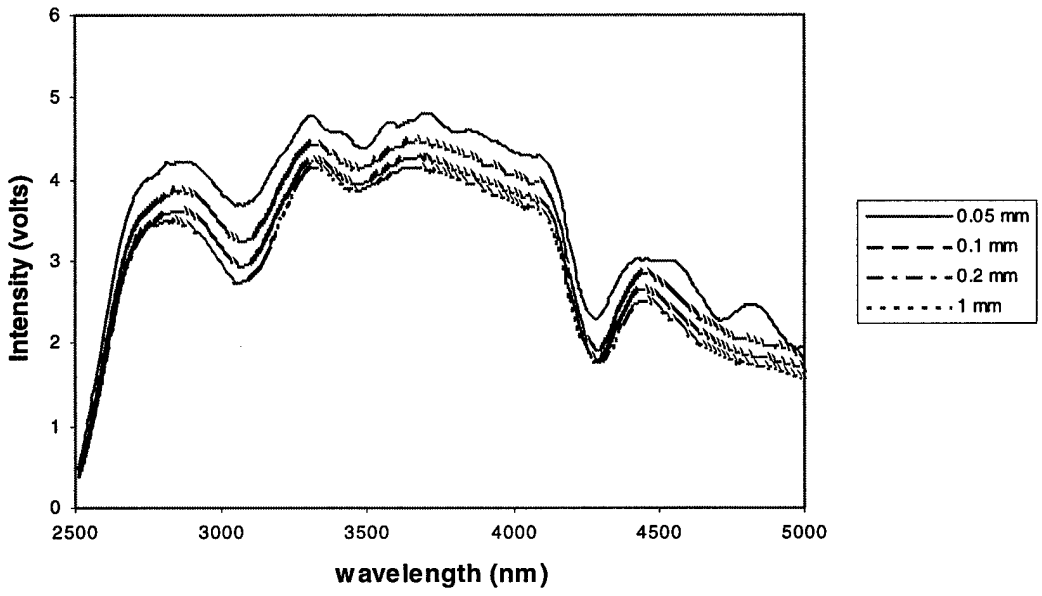

Figure 3.3 Intensity measurements of empty thick cells

When the empty cell is filled, the difference between the refractive index is reduced and the interference pattern is removed. ZnSe windows were chosen over other materials because of its durability. Other infrared lenses are typically made from salts, are water soluble, and require special operating environments.

In order to reduce the effect of the interference pattern on small thickness measurements, an average empty cell value was determined. This value was calculated by averaging the intensity measurements from cells of 0.015, 0.025, 0.040, and 0.050 mm thickness. Empty and filled cell measurements were made for every cell thickness over 0.05 mm.

The absorption coefficient was determined directly from transmittance measurements as explained in the previous section. Cell thickness was selected in order to produce a desired transmittance between 30 and 70%. The absorption coefficient was chosen from transmittance data in this range. If transmittance measurements could not produce a value above 30%, the highest transmittance value was used. In areas of very strong absorption where the smallest spacer was in place, transmittance measurements of less than one percent were used. If two transmittance values were both between 30 and 70%, the one that produced the smoothest absorption curve was selected. Appendix B contains the step by step operating procedure used for collecting data.

4. EXPERIMENTAL VALIDATION

4.1 USING THE KRAMERS-KRONIG RELATIONS WITH PUBLISHED WATER DATA

The first step to the experimental validation was to develop a computer code to calculate the real part of the index of refraction using the Kramers-Kronig optical dispersion relations. The program was written in QuickBasic and based on programs developed by Tucker [24] and Newquist [25]. As indicated previously, in order to use the Kramers-Kronig relations, the entire spectrum must be known. Outside the experimental range, the spectrum must be extrapolated.

4.1.1 Additive Correction to Kramers-Kronig Dispersion Relations. The index of refraction calculated from published absorption data using equation (32) along with established data values from Downing & Williams [12] is shown in Figure 4.1. Clearly, even with accurate assumptions of the spectrum outside the experimental range, an additional term is needed to produce accurate results.

Robertson, et al. [61] took into consideration the effect of an estimated, hypothetical, and very strong narrow ultraviolet (UV) absorption band for water centered at 40,000 cm^{-1} (0.250 μm). The contribution was added to equation (32) and is expressed as

$$\Delta_{UV} n(\omega_o) = \frac{1}{2\pi^2} P \int_0^\infty \frac{\alpha_{UV}(\omega)}{\omega^2 - \omega_o^2} d\omega . \tag{58}$$

For an ultraviolet absorption band centered at some high frequency, ω_H, and limited between ω_a and ω_b, the integration limits on equation (58) can be changed to ω_a and ω_b. For the conditions of the infrared frequency, $\omega_o <<< \omega_H$ and $(\omega_b - \omega_a) <<< \omega_H$, equation (58) can be written as the following second order approximation

$$\Delta_{UV} n(\omega_o) = \frac{\frac{1}{2\pi^2} P \int_{\omega_a}^{\omega_b} \frac{\alpha_{UV}(\omega)}{\omega^2} d\omega}{1-(\omega_o - \omega_H)^2} = \frac{\text{constant}}{1-(\omega_o - \omega_H)^2}. \quad (59)$$

Equation (32) now becomes

$$n(\omega_o) = 1 + \Delta_{UV} n(\omega_o) + \frac{1}{2\pi^2} P \int_0^{\infty} \frac{\alpha(\omega) - \alpha(\omega_o)}{\omega^2 - \omega_o^2} d\omega. \quad (60)$$

The additive constant in equation (59) was chosen to give a value for n of 1.303 at a frequency of 5000 cm^{-1} (2 μm). This is based on the accepted value given by Downing and Williams [12]. This additive term is essentially an offset constant to the calculated values. Recall that in order to use this dispersion relation, the complex function must

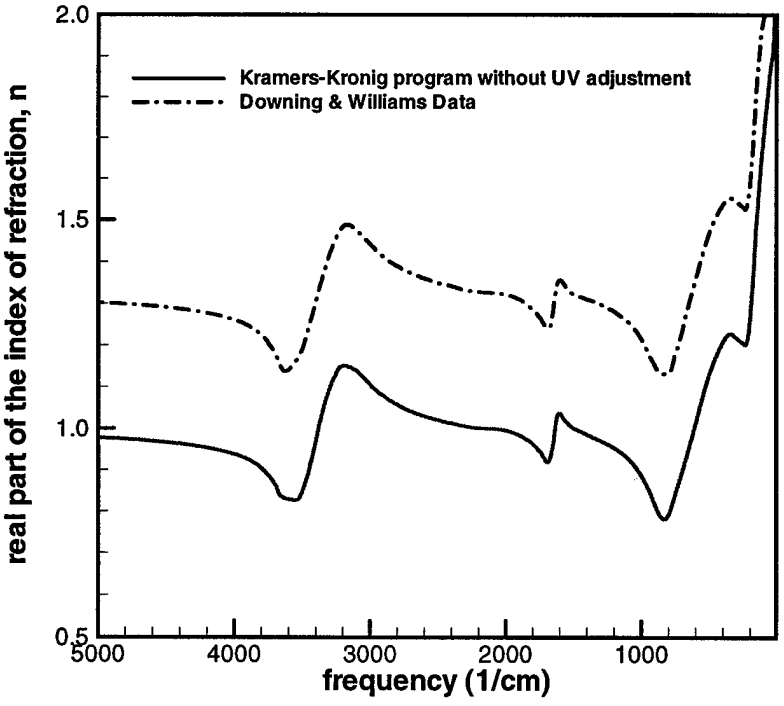

Figure 4.1 Kramers-Kronig program results for water without an adjustment factor. Published absorption data was used to determine n.

vanish as the frequency approaches an infinite wave number. At this infinite wave number, the complex index of refraction is theoretically unity. Some contribution at wavelengths far from the measured results is used to adjust the real part of the index of refraction from the determined value in the visible spectrum to unity at an infinite frequency. Like Robertson et al. [61], Downing and Williams [12] took this into account by assuming the contribution from a single far ultraviolet band that would yield the proper value of the real part of the index of refraction at a frequency which is accurately known. In their case, they used a value for n at 5000 cm^{-1} (2 μm). Unfortunately, they did not publish the method used to add this contribution to equation (32) or the frequency at which they assumed the location of this band. Zolotarev et al. [62] used a model band located at 100,000 cm^{-1} (0.100 μm). The hypothetical absorption band is simply an offset adjustment that must be used in order to match existing data for frequencies. The location of the hypothetical absorption band can have a significant impact on the determination of n outside the experimental data range.

The index of refraction for hydrocarbon fuels at 16960 cm^{-1} (0.590 μm) has been determined [57]. In order to use this value in the Kramers-Kronig method, calculations of the real part of the index of refraction of water were made to investigate the effect of the location of the hypothetical UV band. Figure 4.2 shows the calculated real part of the index of refraction by choosing a known reference value at 5000 cm^{-1} (2 μm). The location of the ultraviolet band was placed at 40,000 cm^{-1} (0.250 μm) and then at the higher frequency of 100,000 cm^{-1} (0.100 μm). The effect on n in the experimental data range was negligible. This was not the case for calculations done with the reference value at 16,960 cm^{-1} (0.590 μm). The UV band at 40,000 cm^{-1} (0.250 μm) produced

values that were in far less agreement that values calculated with the UV band located at 100,000 cm^{-1} (0.100 μm), as shown in Figure 4.3. The calculated value for n using the UV band at 100,000 cm^{-1} (0.100 μm) produced nearly same results for both reference points. In light of these results, the values for the index of refraction for the hydrocarbon fuels at 16960 cm^{-1} (0.590 μm) and an UV band at 100,000 cm^{-1} (0.100 μm) were used for the determination of the real part of the index of refraction in the infrared.

Figure 4.4 shows the calculated value of n using the computer program with the correction factor used by Robertson et al. [61]. As for Figure 4.1 and 4.2, the computer program used absorption data from Downing and Williams [12] in the frequency range of 5000-10 cm^{-1} (2-1000 μm). Outside this range, the assumptions employed by Robertson

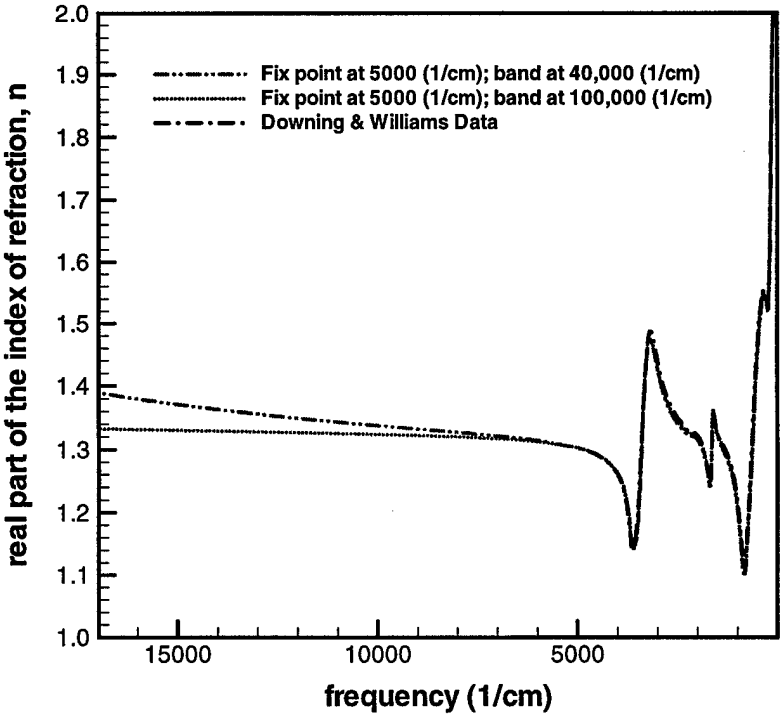

Figure 4.2 Calculated real part of the index of refraction of water using a fixed point at 5000 cm^{-1} and hypothetical UV bands at 40,000 and 100,000 cm^{-1}

et al. [61] were used. These assumptions included using data from Palmer and Williams [18] in the 8400-5000 cm^{-1} (1.19-2 μm) range and then letting $\alpha(\omega)$ decrease linearly to a value of 1.5 x 10^{-4} cm^{-1} at 16960 cm^{-1} (0.590 μm), an independently determined value. At higher frequencies, $\alpha(\omega)$ went to zero. Below 10 cm^{-1} (1000 μm), $\alpha(\omega)$ also went to zero. As seen in Figure 4.3, the computer program produced values of n that are in excellent agreement with accepted values which have been determined both computationally and experimentally [12].

4.1.2 Effect of Wing Extrapolation. Next, the effect of data extrapolation outside the experimental data range was investigated. According to Bertie et al., [11], the assumptions used to extrapolate data outside the experimental range had little effect on

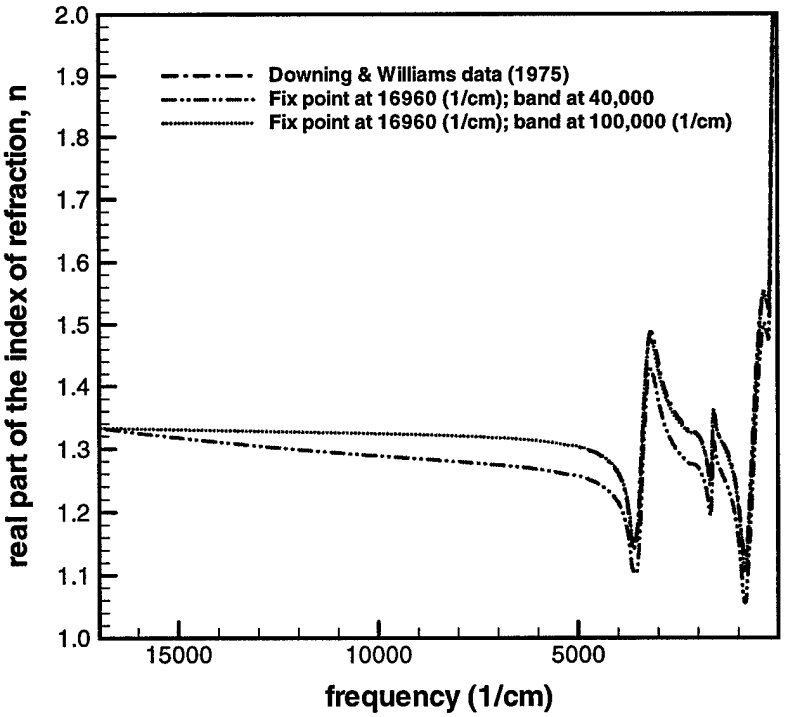

Figure 4.3 Calculated real part of the index of refraction of water using a fixed point at 16960 cm^{-1} and hypothetical UV bands at 40,000 and 100,000 cm^{-1}

the calculation of n using the Kramers-Kronig relations. This may be true for ice, but was not the case for water, as demonstrated by Ghosal et al. [32]. Using Downing and Willaims [12] data in the 5000 – 667 cm^{-1} (2-15 μm) range as the experimental data, n was calculated based on the assumption that $\alpha(\omega)$ was zero outside the experimental range. Further, a calculation was performed assuming $\alpha(\omega)$ was constant from the endpoint of the experimental values. Figure 4.5 shows the calculated n using both of these assumptions compared with accepted values. The disagreement with the accepted values of n stem from the fact that at 667 cm^{-1} (15 μm), the value of $\alpha(\omega)$ is approximately 3000 cm^{-1}. This value decreases eventually to zero as the frequency goes to zero. Both assumptions, that $\alpha(\omega)$ is zero or that it remains constant, on the low

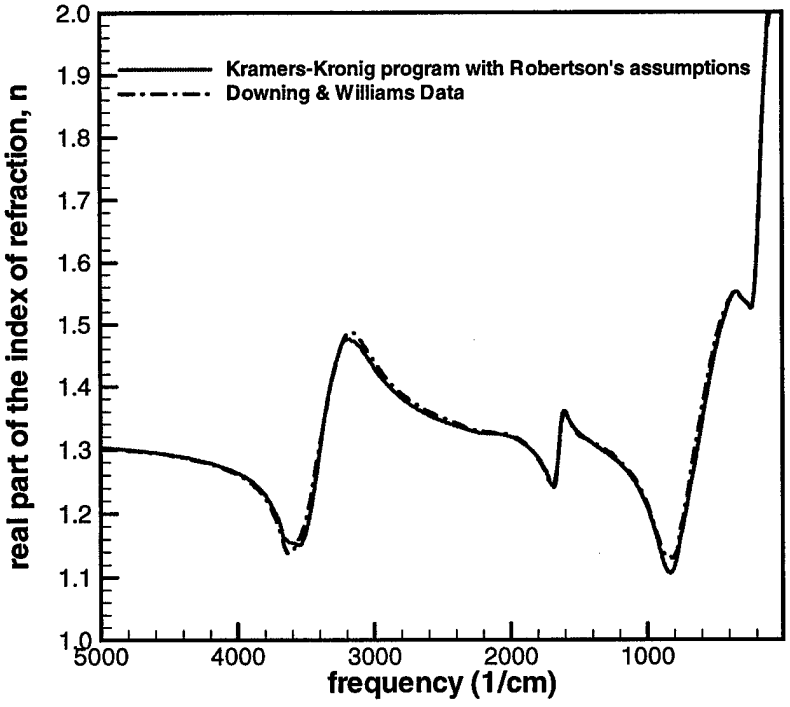

Figure 4.4 Kramers-Kronig program results for water using assumptions by Robertson et al. [61] to extrapolate outside the data range

frequency side of the data range are not very accurate. A more accurate assumption is one that involves the imaginary part, k, of the index of refraction. Recall equation (28) for the extinction coefficient,

$$k(\omega) = \frac{\alpha(\omega)}{4\pi\omega}.$$

Since k is a function of the frequency and the absorption coefficient, an assumption of its behavior outside the data range will probably produce a better assumption about $\alpha(\omega)$. A relatively large value for α can occur at high frequencies when the extinction coefficient, k, is small. The absorption coefficient is used in the relation since it is determined directly from experimental results.

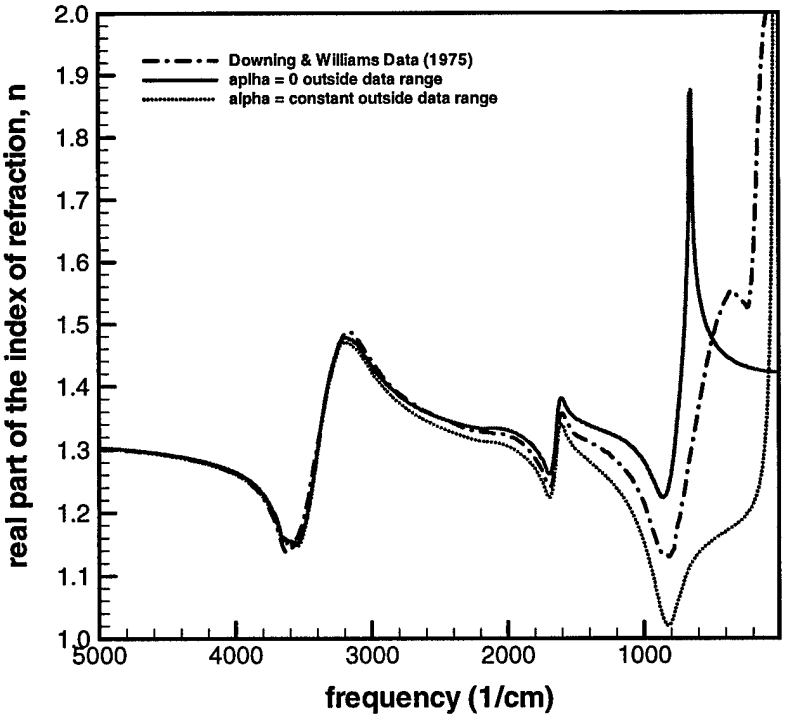

Figure 4.5 Kramers-Kronig program results for water using assumptions for the absorption coefficient to extrapolate outside the data range

Figure 4.6 shows the calculated n using two different assumptions about k. The first was that k was constant from the endpoints of the experimental values. Second, k was constant from the low frequency range to zero frequency and linearly went to zero from the high frequency end point to 16960 cm^{-1} (0.590 μm). These assumptions more accurately model the behavior of k and α(ω) outside the experimental data range and both produced almost identical results for the value of n. The results are much better in agreement than the results using the assumptions for α(ω). Additionally, for the calculations in both Figures 4.4 and 4.5, data points from the range of 16960-10 cm^{-1} (0.590-1000 μm) were included from the experimental data points. These points were then used in the numerical integration part of the evaluation of the Kramers-Kronig

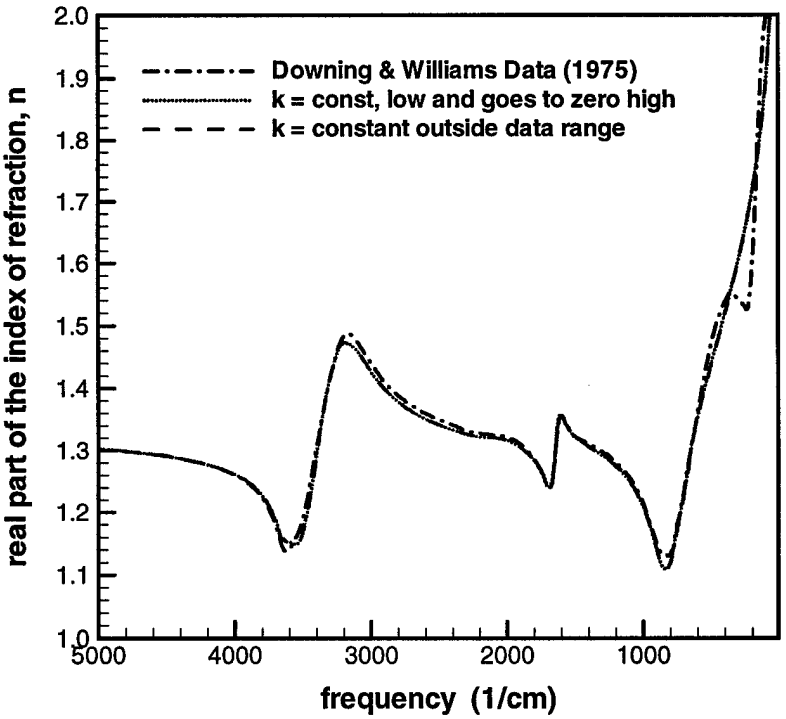

Figure 4.6 Kramers-Kronig program results for water using assumptions for the imaginary part of the index of refraction to extrapolate outside the data range

relation. This produced better results than by using just data points in the experimental data range in the numerical integration because the wing contributions are minimized.

Therefore, modeling the absorption coefficient upon the actual behavior of the extinction coefficient will produce better results for the real part of the index of refraction. Another reason for assumptions about k producing better results is simply the fact that the original dispersion relation calculates the real part of the index of refraction from the extinction coefficient. Extrapolating data using assumptions strictly about the absorption coefficient will produce significant error if the absorption coefficient is not modeled properly, especially if the assumptions do not take into consideration the effect of large, strong absorption bands.

4.1.3 Wing Extrapolations with Subtractive Kramers-Kronig Method.

Figure 4.7 shows the calculated value of n using the subtractive Kramer-Kronig method. The reference value for n was taken at 5000 cm^{-1} (2 μm). Two assumptions for the extrapolated data range were used. One used the assumptions that Robertson et al. [60] used for the absorption coefficient, the other was that the imaginary part of the index of refraction was constant at the low end of the experimental data range and went to zero at the high end of the range. Both assumptions provided similar results. This method can be very sensitive to the chosen reference value as reported by Palmer et al. [33]. Using a reference value from either the center of the strong absorption band at 3390 cm^{-1} (2.95 μm) or far away from the experimental data range (16960 cm^{-1} (0.590 μm)) produced erratic results. The reference value must be close to or within the experimental range. The method did converge on a solution more quickly than the original Kramers-Kronig relations and also did not require an adjustment factor in order to converge upon a

solution. However, the subtractive method does require independently determined optical constant data near the experimental data range for a reference point.

4.2 EXPERIMENTAL RESULTS FOR WATER

Figure 4.8 shows the experimentally determined absorption coefficient for water as compared to the published data. Measurements were made with the two smallest available cell widths, 0.015 and 0.025 mm. Water is highly absorbing in the infrared. Although the absorption coefficient of the band centered at 3390 cm^{-1} (2.95 μm) is over 50% less than the accepted value, there is still good agreement between the experimental data and the published values. A much smaller cell thickness must be used in order to

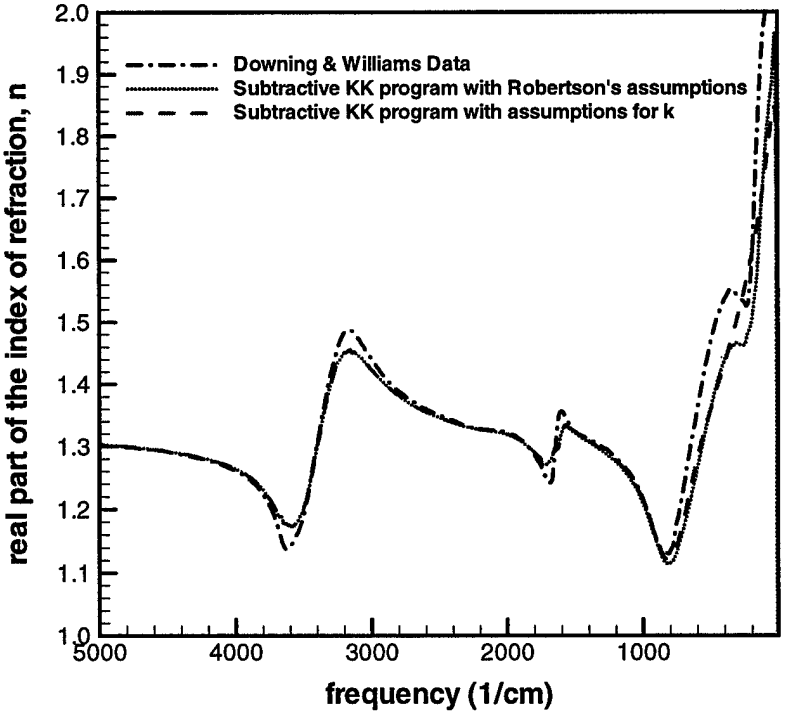

Figure 4.7 Subtractive Kramers-Kronig program results for water using n = 1.303 at5000 cm^{-1} as the reference value

measure absorption coefficients that are the order of 10^4. The absorption band centered at 1640 cm^{-1} (6.10 μm) is narrower than the band at 3390 cm^{-1} (2.95 μm). The bandwidth used was too large to accurately measure this absorption. The discrepancy at this frequency is due to the size of the spectral slit width of the monochromator. The spectral slit width is the small spectral region that is isolated by the exit and entrance slit of the monochromator. If the width of the absorption band is smaller than the spectral slit width, the detector will measure intensity that is outside the absorption band. This will cause the measurement of a transmittance value that is higher than it actually is, thus causing an under-calculated value for the absorption coefficient. Interference effects caused the wavy pattern seen in the weaker absorbing ranges. Using larger cell widths to

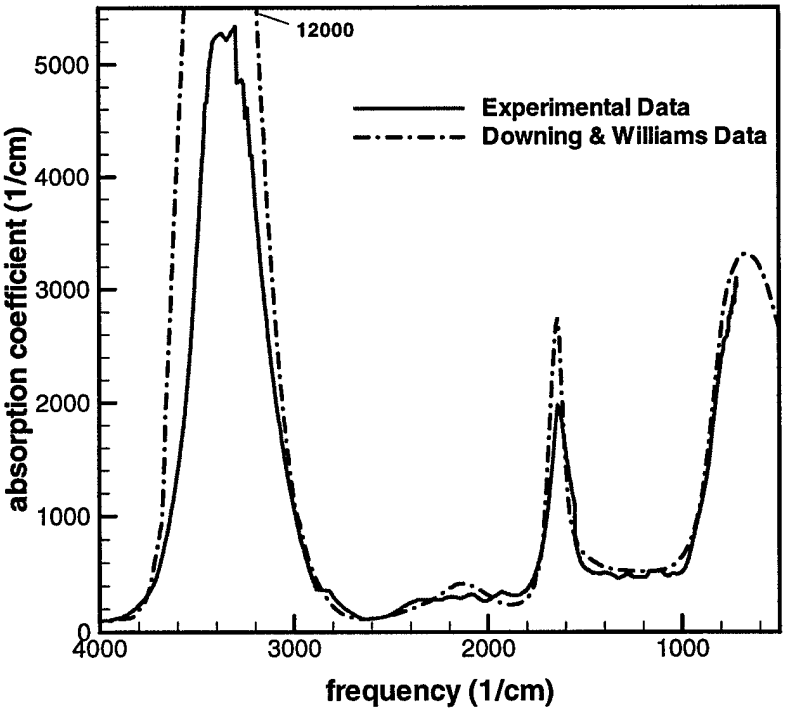

Figure 4.8 Experimentally determined absorption coefficient for water

minimize this effect could not be done because of how strongly water absorbs across the infrared spectrum.

Figure 4.9 shows the calculated index of refraction for water using the experimental data. Outside the experimental data range, the assumptions by Robertson et al. [61] were used as described in the previous section. The lower calculated absorption coefficient at 3390 cm^{-1} (2.95 μm) caused the reduced fluctuation in the index of refraction. However, despite this difference in calculated absorption coefficients, the effect on the calculation of the real part of the index of refraction is much smaller. The experimental values differ with accepted values by less than 10% at the largest discrepancy.

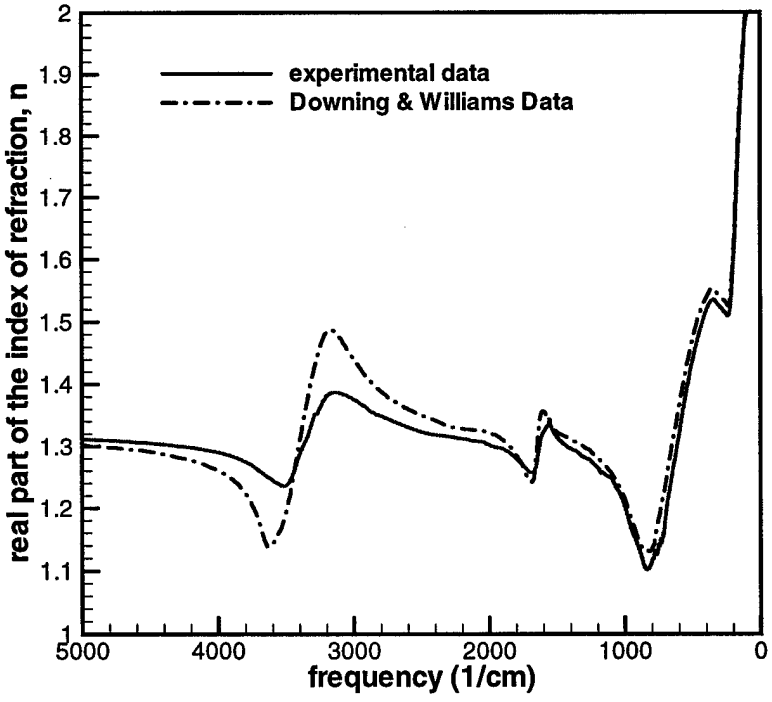

Figure 4.9 Experimentally determined real part of the index of refraction for water

The results for water prove that the designed experiment will provide acceptable results for liquids that are slightly less absorbing. For the liquid hydrocarbon fuels, the bandwidth could be decreased to provide greater resolution, and since the fuels are not nearly as absorbing as water, utilizing thicker cell widths can minimize the interference effects.

5. RESULTS AND DISCUSSION

The results of the investigation are presented in three sections, paraffin, olefin, and aromatic. For each fuel, figures showing the transmittance curves, absorption coefficient, extinction coefficient, k, and the real part of the index of refraction, n are given. The experimental data is presented in tabular form in Appendix C. The absorption coefficient was determined directly from the transmittance data using the guidelines outlined in the experimental protocol given in section three. The reduction of the bandwidth significantly reduced the radiant intensity, and thus, the signal to noise ratio decreased. This caused some difficulties in acquiring reliable data in the longer wavelength (weaker energy) region of the experimental data range. The best signal to noise ratio that was present was from 2.5-5.4 μm. (4000-1852 cm^{-1}). The signal to noise ratio worsened as the wavelength increased. API data was used as a guide to help determine the difference between noise and absorption due to molecular structure. API data was also used as a guide to determine which cell thickness to use at which location in the experimental data range.

The method used for extrapolating data outside the experimental range for use in the Kramers-Kronig analysis was the same for all of the fuels. Any available data from API reports was used to expand the experimental data range. For all the fuels, except iso-pentane, this expanded the data range to 2-15 μm (5000-667 μm) and in some cases, the range expanded to 25 μm (400 cm^{-1})(see Table 2.1 for available API data ranges). The value of the absorption coefficient was then held constant from the last value at the edge of the expanded data range to 16960 cm^{-1} (0.590 μm) on the high frequency side and to 10 cm^{-1} (1000 μm) on the low frequency side. The absorption coefficient then went to

zero outside these frequencies. This assumption was used for the data extrapolation, instead of modeling the absorption coefficient on the extinction coefficient, because it was the easiest and best method to fit the behavior of the transmittance data available. Using assumptions about the extinction coefficient had a negligible effect on the calculations of the real part of the index of refraction as compared to using the assumption about the transmittance curve. This is because the assumptions are modeling areas of the spectrum that have very little absorption. Outside of the infrared region, the hydrocarbon fuels exhibit little absorption, except for narrow bands in the ultraviolet region in the cases of the olefin and aromatics. The effect of any ultraviolet absorption is taken into consideration with the adjustment factor as explained Section 2. For every fuel, the absorption coefficient was assigned a value of less than 10 cm^{-1} outside the data range, indicated little to no absorption.

Table 5.1 shows the results for all of the fuels at 3.39 μm 2950 cm^{-1}). For the paraffin fuels, this location is just at the edge of their strongest absorption band. Because the absorption coefficient is changing very rapidly, measured transmittance is significantly influenced by the spectral slit width.

5.1 PARAFFIN

The experimental results for the paraffin fuels are presented in two sub-sections. The normal, or straight chain, paraffin fuels are separated from iso-octane and iso-pentane.

5.1.1 Iso-Octane and Iso-Pentane. Figure 5.1 and 5.2 show the transmittance curves for iso-octane and iso-pentane. Figures 5.3 and 5.4 show the absorption curve,

Table 5.1 Experimental results at 3.39 μm

Fuel	absorption coefficient, α (cm^{-1})	extinction coefficient, k	refractive index, n
iso-octane	2573	0.0695	1.336
iso-pentane	1655	0.0447	1.310
n-hexane	1352	0.0365	1.318
n-heptane	1264	0.0341	1.338
n-nonane	1184	0.0320	1.355
n-decane	1108	0.0229	1.362
1-hexene	1187	0.0320	1.357
o-xylene	472	0.0127	1.487
toluene	211	0.0057	1.484

Figures 5.5 and 5.6 show the imaginary part of the index of refraction and Figures 5.7 and 5.8 show the real part of the index of refraction for iso-octane and iso-pentane respectively. Transmittance measurements were difficult to obtain for iso-pentane because of its high vapor pressure. Since the sample cell did not perfectly seal (a disadvantage to demountable cells), the fuel would quickly evaporate. Data was acquired in four-minute intervals. During the scan, the cell was continually monitored to ensure that the fuel had not evaporated down to a level that crossed the incident beam. If the level did, or after four minutes, the cell was evacuated, refilled, and placed back into position.

Table 5.2 presents a comparison of the results at 3.39 μm (2950 cm^{-1}) for iso-octane with the results from the API and the study done by Drallmeier and Peters [5]. The iso-octane data from the API was digitized and is presented for comparison with the

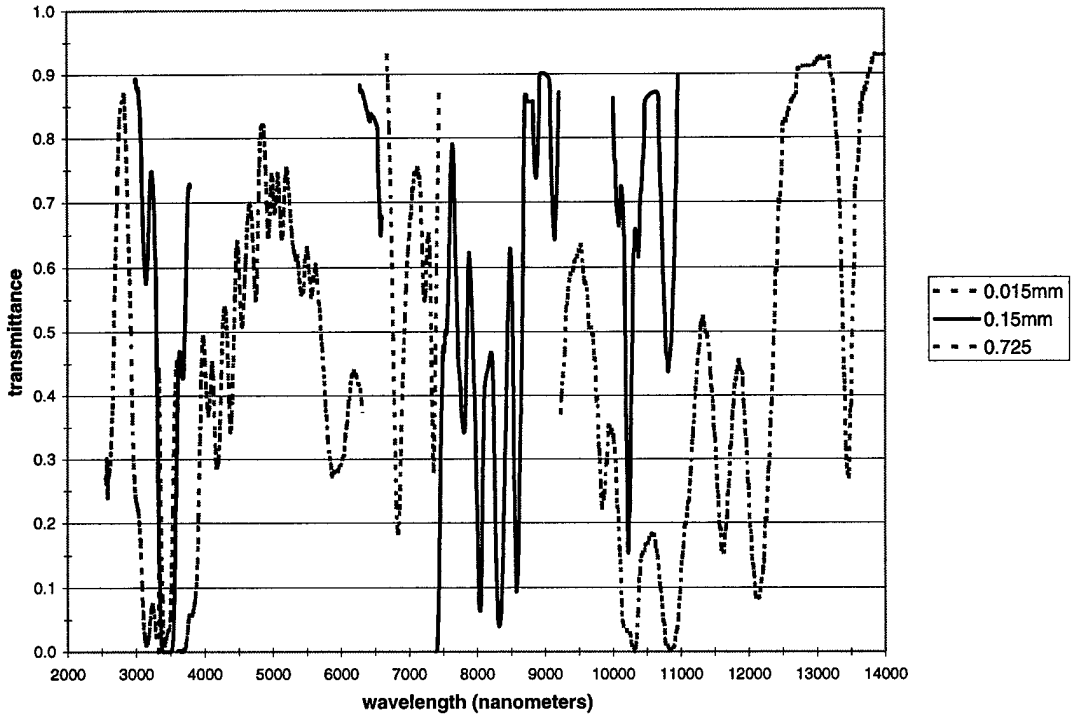

Figure 5.1 Transmittance of iso-octane

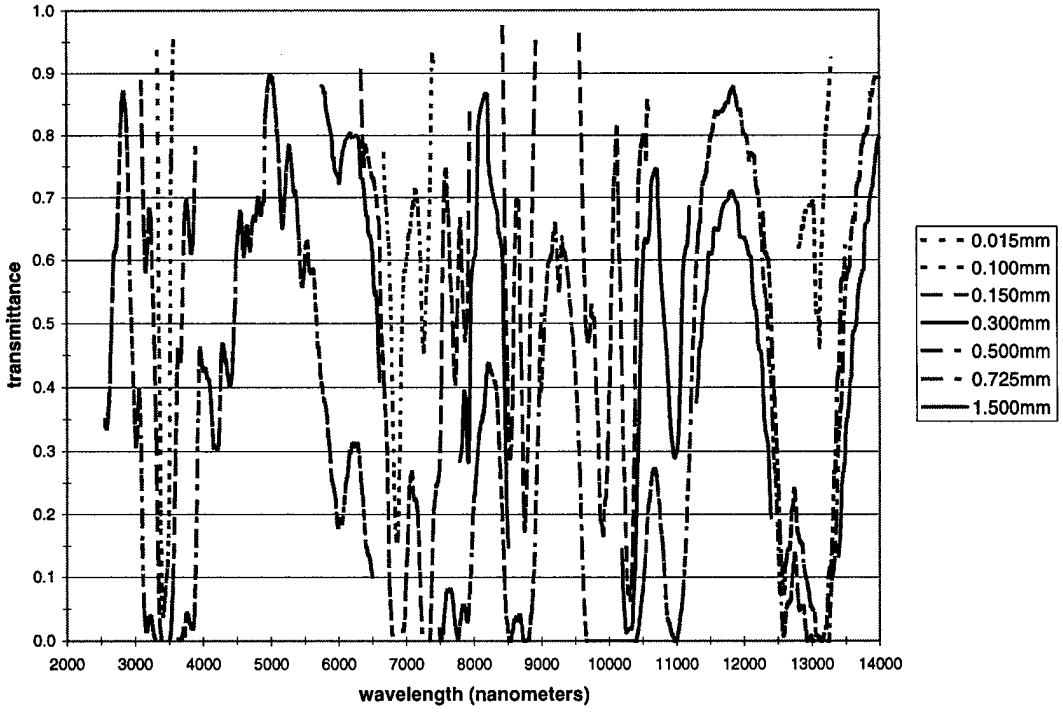

Figure 5.2 Transmittance of iso-pentane

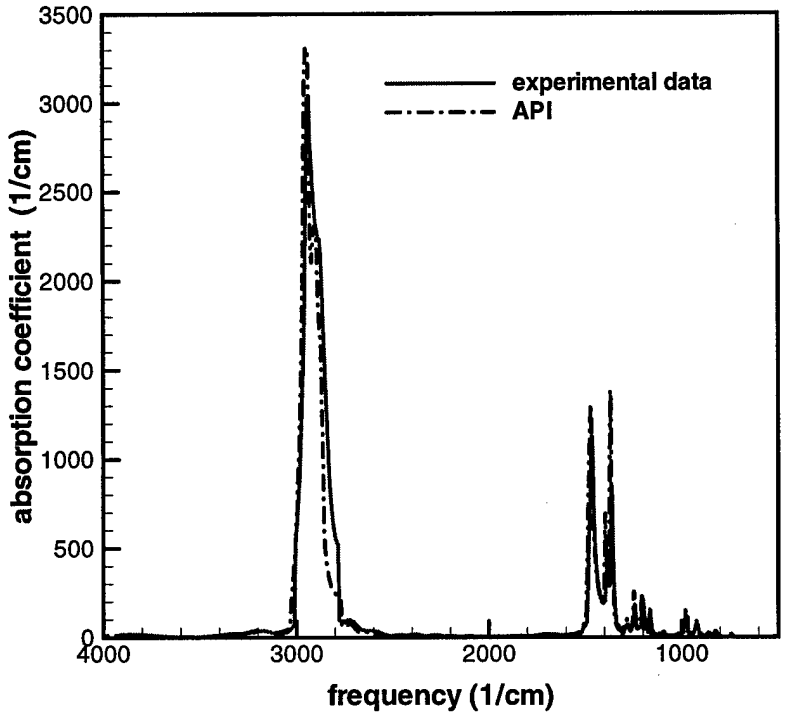

Figure 5.3 Absorption coefficient for iso-octane

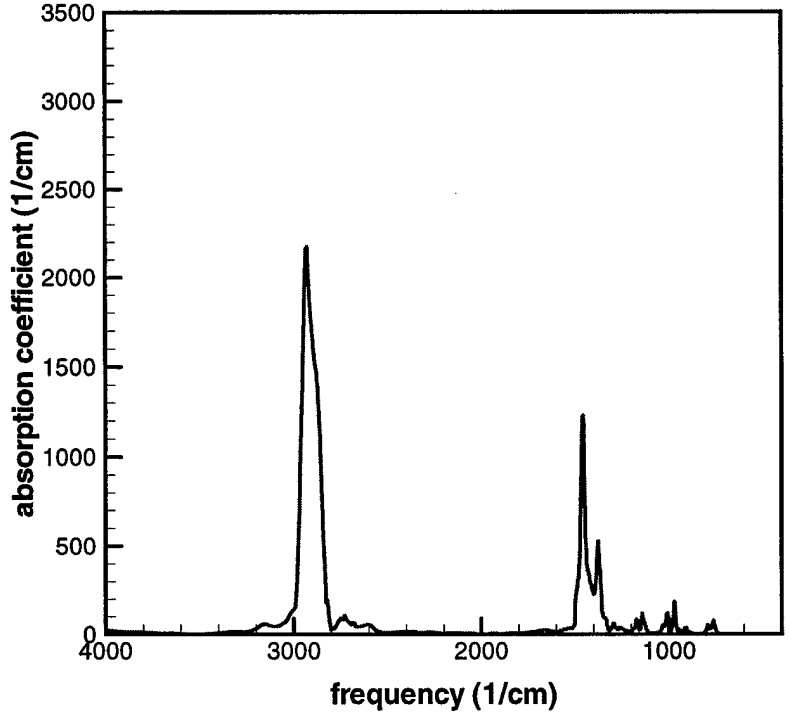

Figure 5.4 Absorption coefficient for iso-pentane

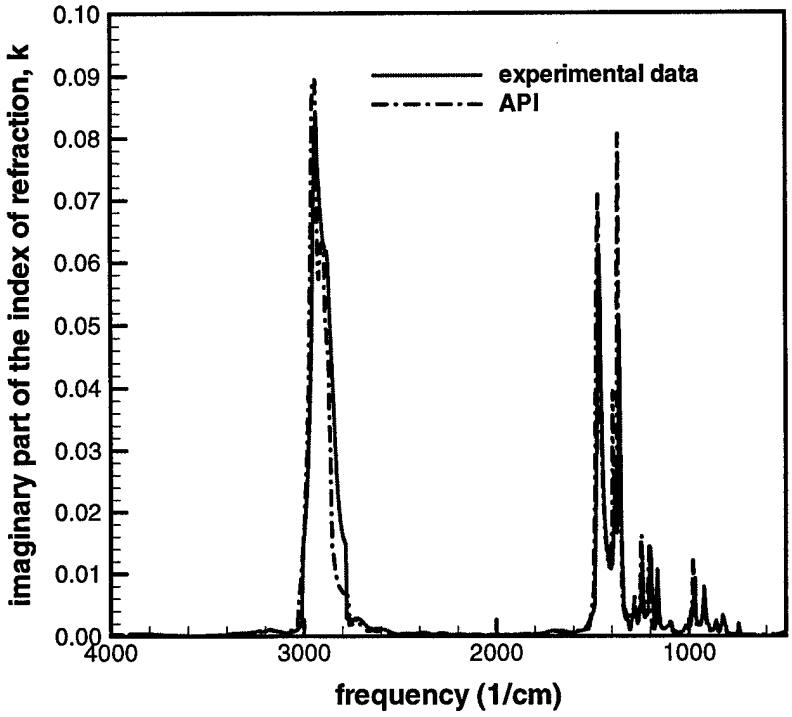

Figure 5.5 Extinction coefficient for iso-octane

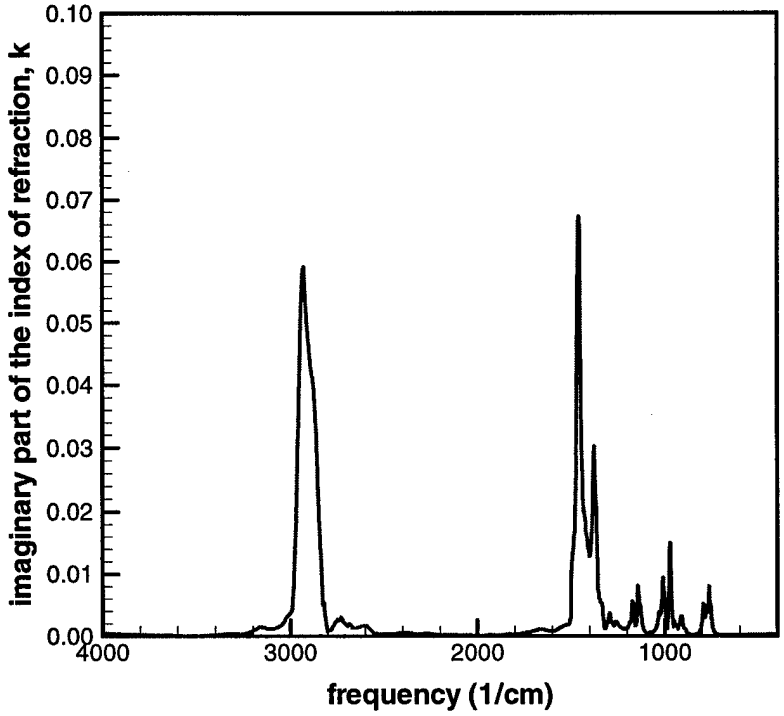

Figure 5.6 Extinction coefficient for iso-pentane

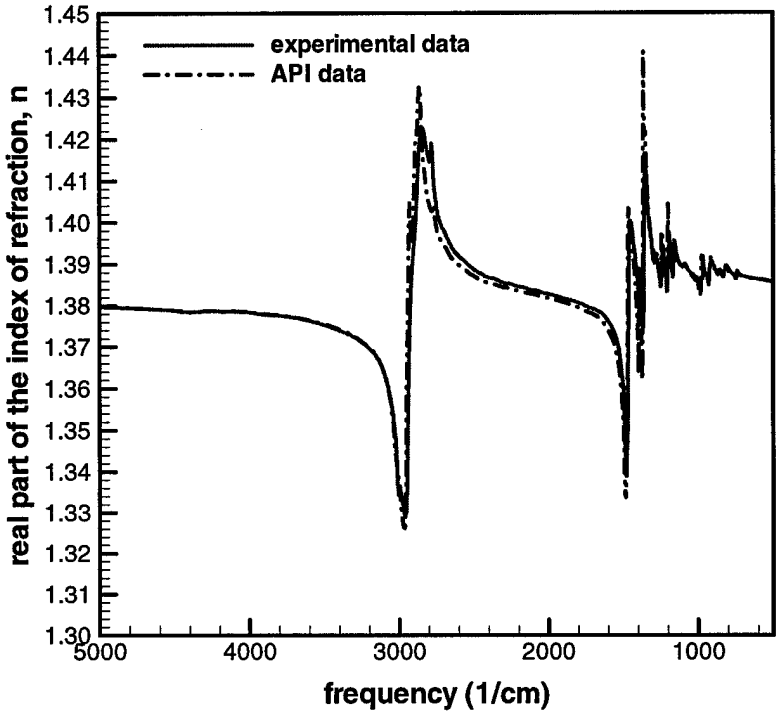

Figure 5.7 Real part of the index of refraction for iso-octane

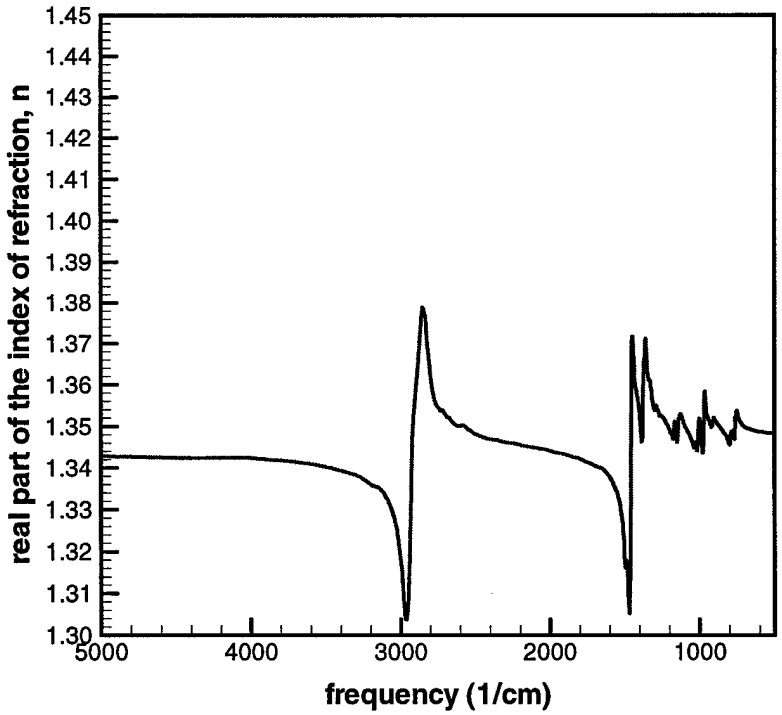

Figure 5.8 Real part of the index of refraction for iso-pentane

experimental data. Across the experimental spectrum, there is good agreement for iso-octane between the experimental data and the API data. At 3.39 μm (2950 cm^{-1}), there is good agreement (less than 4% difference) with the determined values of the refractive index, n, between the experiment and the API results. The absorption coefficient, α, and the extinction coefficient, k, determined in the experiment closely agree with the values obtained by Drallmeier and Peters [5]. The absorption coefficient and the extinction coefficient both differ by approximately 5%.

The experimental data was unable to accurately show the doublet structure found in paraffin fuels in the absorption band located at 3000-2800 cm^{-1} (3.33-3.57 μm). This is due to a combination of three factors. First the size of the bandwidth produces a spectral slit width that is too large to accurately detect the fine structure of the transmittance curve. Second, the signal to noise ratio may be too low to accurately measure the intensity of the radiant beam. Lastly, the averaging technique used to counter the interference effect on the thin cells may have reduced the accuracy of the empty cell intensity value.

The absorption band between 3000 and 2800 cm^{-1} (3.33-3.57 μm) may be under determined by as much as 20%, as compared with API data. In the longer wavelength regions, an underestimation of the absorption band can produce a larger error in the value of the extinction coefficient. This can be seen in Figure 5.5. The strength of the narrow absorption between 1400–1340 cm^{-1} (7.14-7.46 μm) may be under-measured by as much as 50%. This can cause a significantly lower value for the extinction coefficient because of the smaller value for the frequency used in the calculation. The under determination can be caused by the same reasons which reduced the ability to accurately measure the

narrow absorption bands and can also be caused by errors in cell width. The estimated tolerance on the teflon spacers smaller than 0.1 mm is ± 20%. If the spacer is greater than the accepted value of 0.015 mm, the absorption coefficient will be under determined.

As shown for water, the real part of the index of refraction is less sensitive to the accuracy of transmittance measurements. Since data outside the experimental data range was available from the API for iso-octane, it was used in the Kramers-Kronig analysis.

Table 5.2 Comparison of results for iso-octane at 3.39 μm

Fuel	absorption coefficient, α (cm^{-1})	extinction coefficient, k	refractive index, n
Experiment	2573	0.0695	1.336
API	3311	0.0895	1.384
Drallmeier & Peters [5]	2447	0.066	1.44

The regions outside the experimental data region for iso-pentane were modeled after iso-octane since no other data was available. The only difference was that the absorption coefficient was assumed to be constant from 700-10 cm^{-1} (14.28-1000 μm) instead of 400-10 cm^{-1} (25-1000 μm), as in the case of iso-octane, since API data was available out to 400 cm^{-1}. For the region of 5000-4000 cm^{-1} (2-2.5 μm), API data was used for iso-octane and the same data was used for iso-pentane because of the similarities in molecular structure between the two compounds.

5.1.2 Normal Paraffins. The results for the normal paraffin fuels (n-hexane, n-heptane, n-nonane, and n-decane) are presented in Figures 5.9 through 5.24. The transmittance curves are presented in Figures 5.9 through 5.12. The absorption coefficients are shown in Figures 5.13 through 5.16, the extinction coefficients are presented in Figures 5.17 through 5.20, and the real part of the index of refraction is shown in Figures 5.21 through 5.24. As expected, the absorption coefficients and extinction coefficients are very similar for all four of the fuels in this group. This is due to the close molecular structure similarity of all four of the fuels. These fuels are less absorbing across the experimental data range as compared to iso-octane and iso-pentane. The straight chain bond structure of the normal paraffin fuels is less absorbing than the more compact carbon bonding of the iso-octane and iso-pentane molecules.

5.2 OLEFIN

The results for the olefin examined in this study, 1-hexene, are presented in Figures 5.25 through 5.28. The transmittance curve is shown in Figure 5.25. The absorption coefficient and extinction coefficient is shown in Figure 5.26 and 5.27 respectively. The real part of the index of refraction is presented in Figure 5.28. Like iso-pentane, transmittance measurements were difficult to obtain for 1-hexene because of its high vapor pressure. Additionally, 1-hexene required extra precautions for proper ventilation because of the inhalation dangers caused by its fumes.

1-Hexene has two very strong absorption bands of almost equal strength. The first is located between 3000 –2900 cm^{-1} (3.33-3.45 μm),. The second is centered at

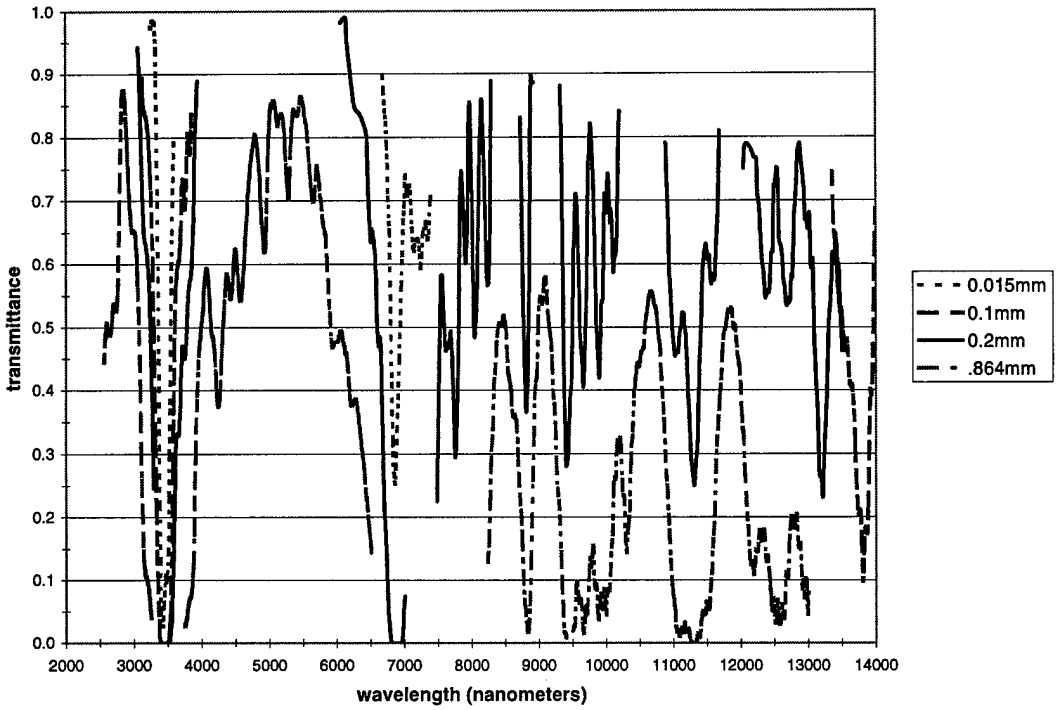

Figure 5.9 Transmittance of n-hexane

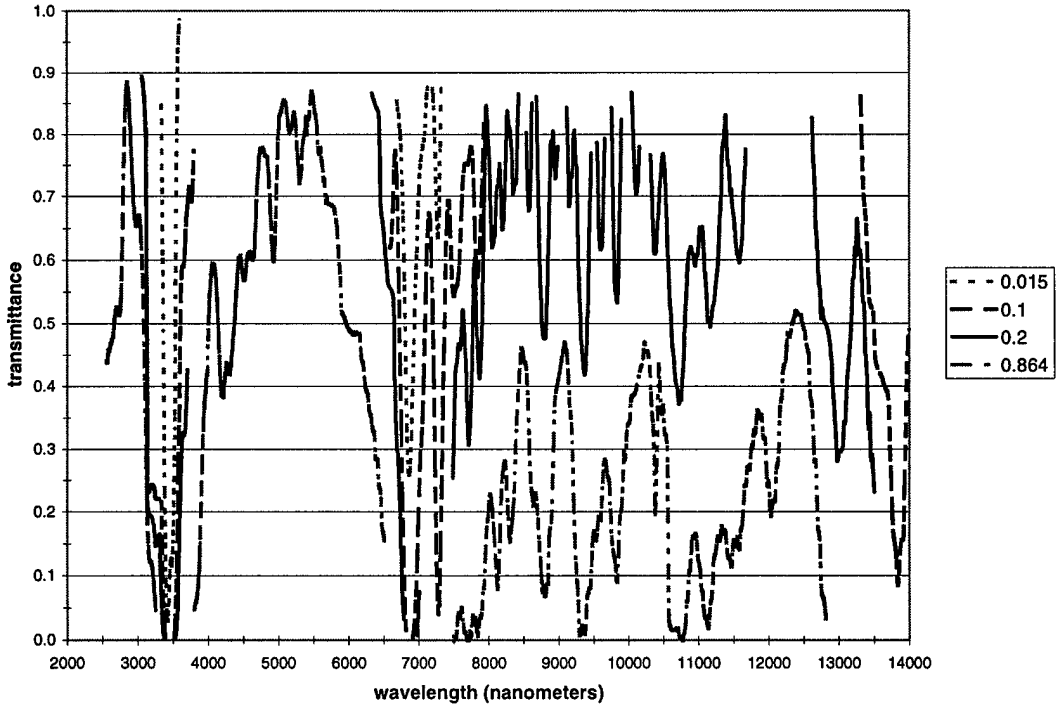

Figure 5.10 Transmittance of n-heptane

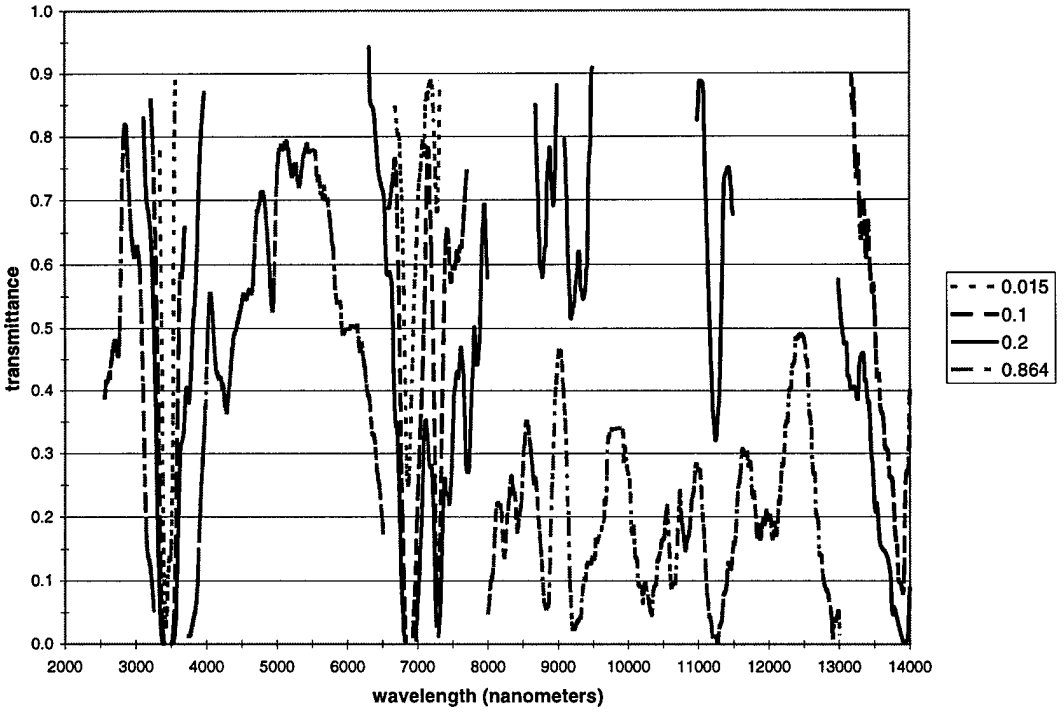

Figure 5.11 Transmittance of n-nonane

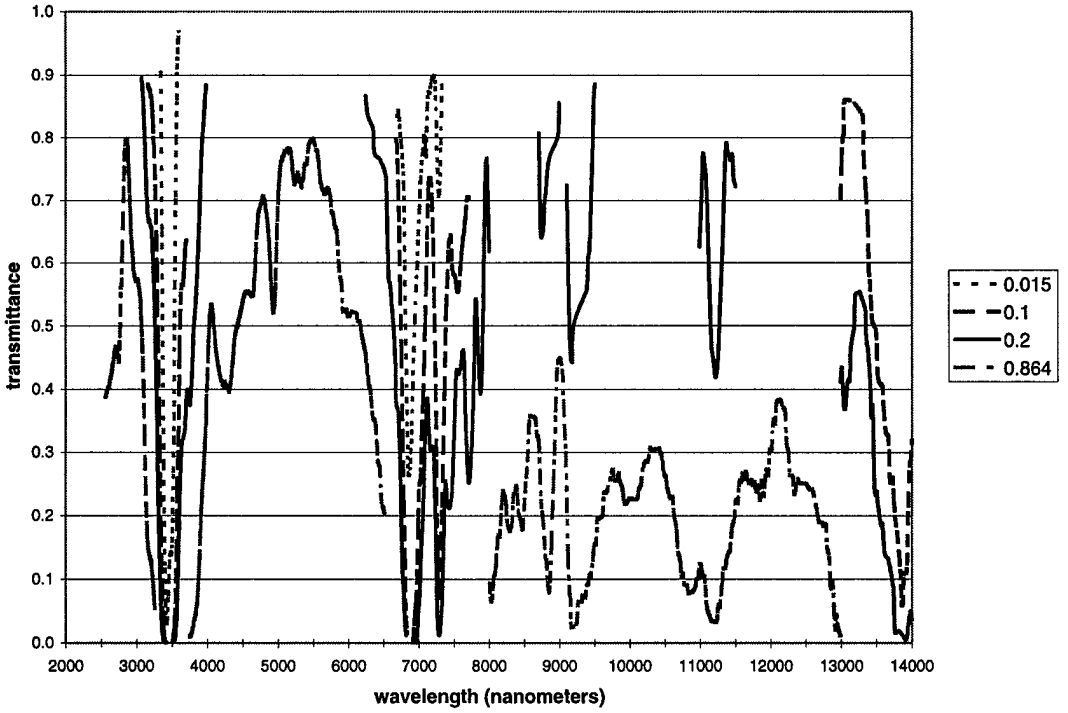

Figure 5.12 Transmittance of n-decane

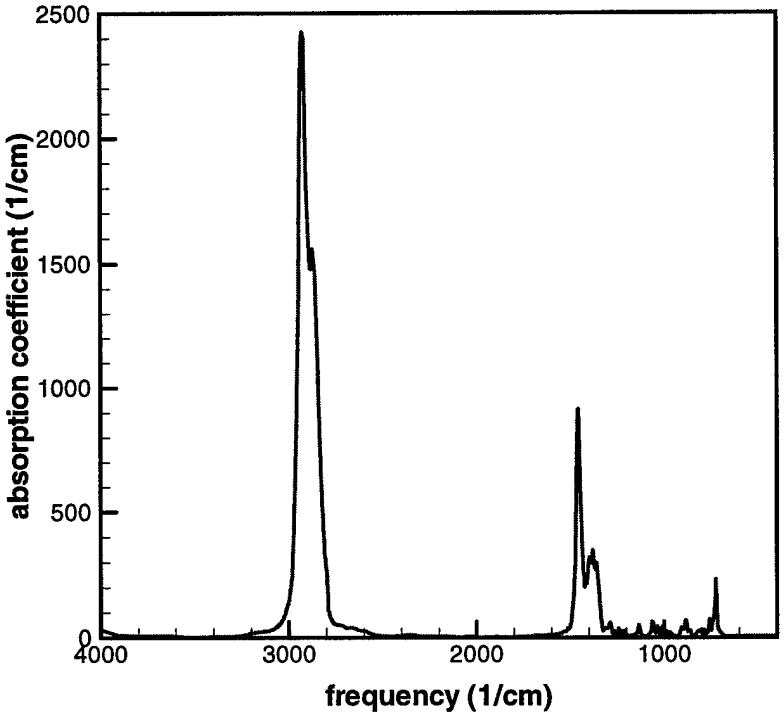

Figure 5.13 Absorption coefficient for n-hexane

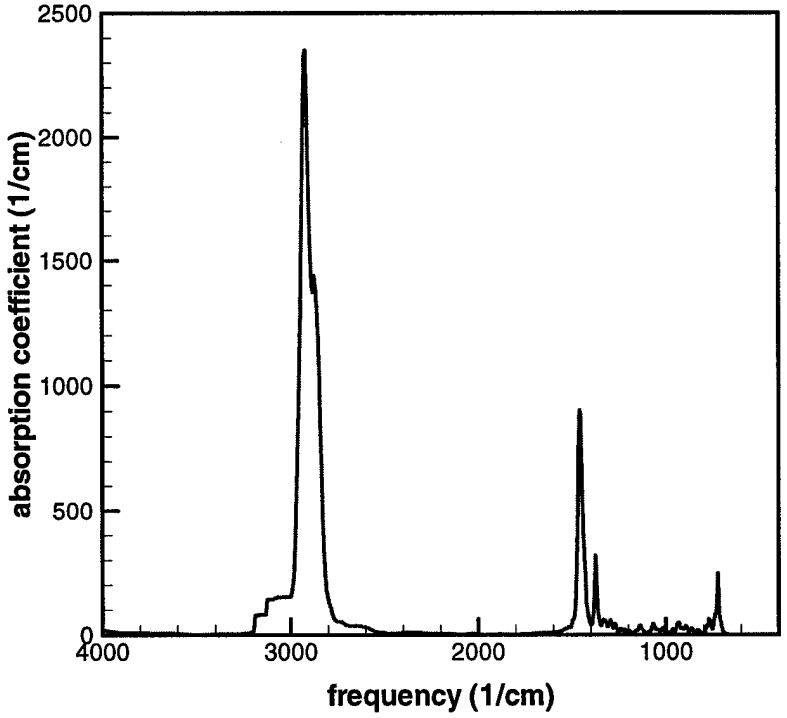

Figure 5.14 Absorption coefficient for n-heptane

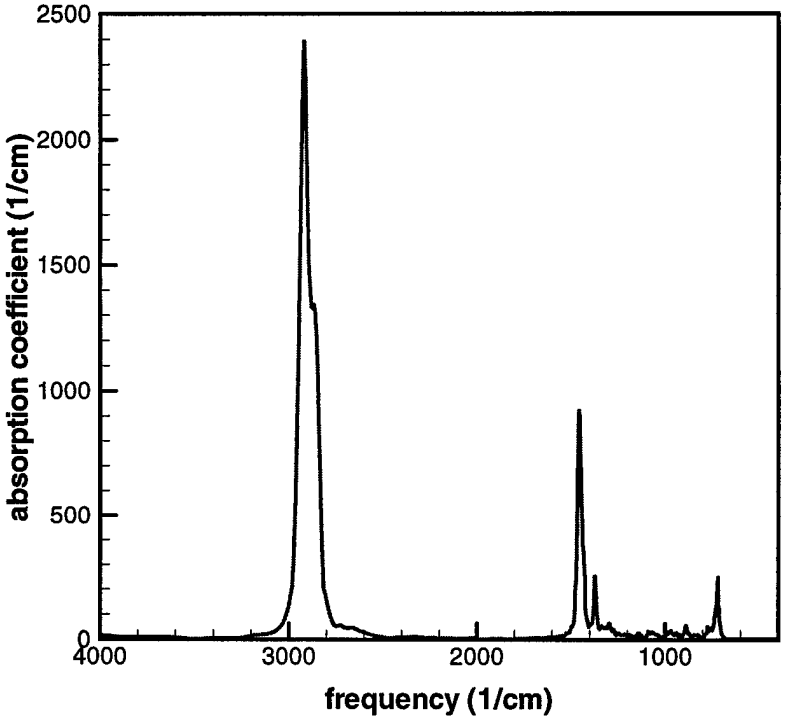

Figure 5.15 Absorption coefficient for n-nonane

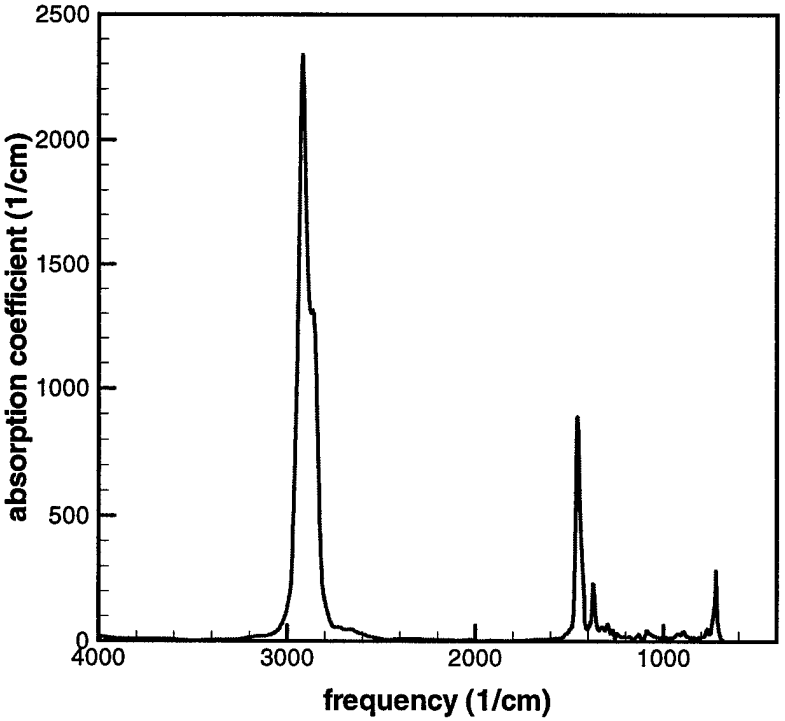

Figure 5.16 Absorption coefficient for n-decane

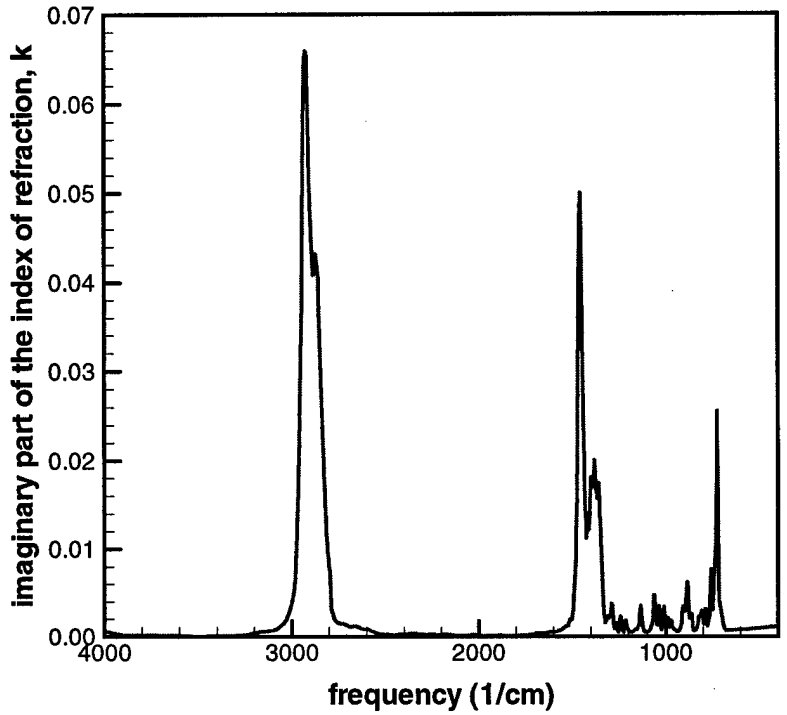

Figure 5.17 Extinction coefficient n-hexane

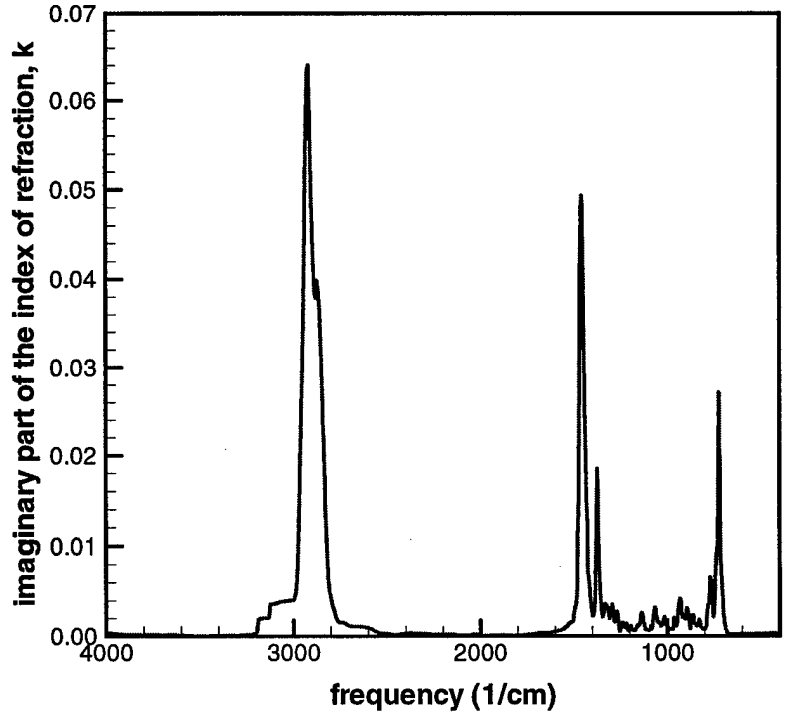

Figure 5.18 Extinction coefficient for n-heptane

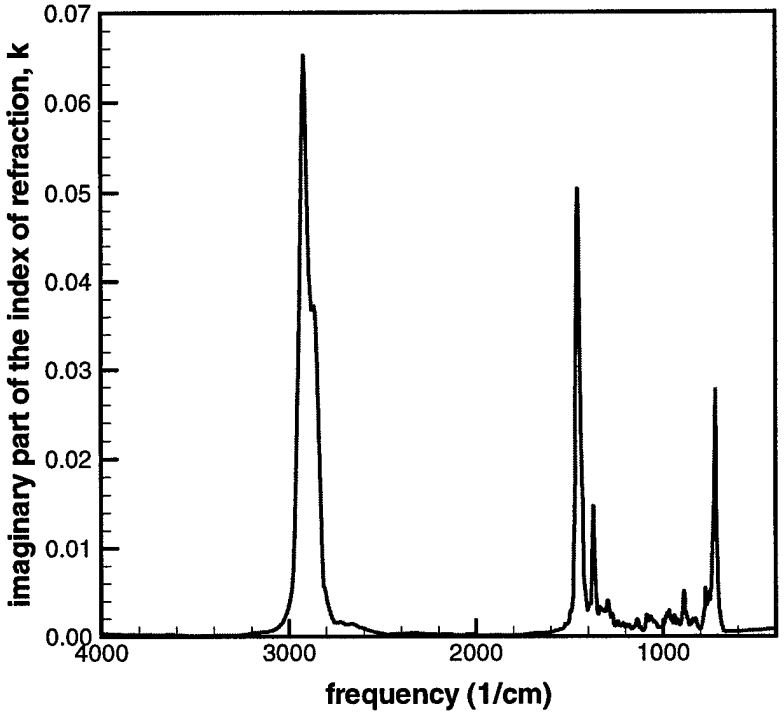

Figure 5.19 Extinction coefficient for n-nonane

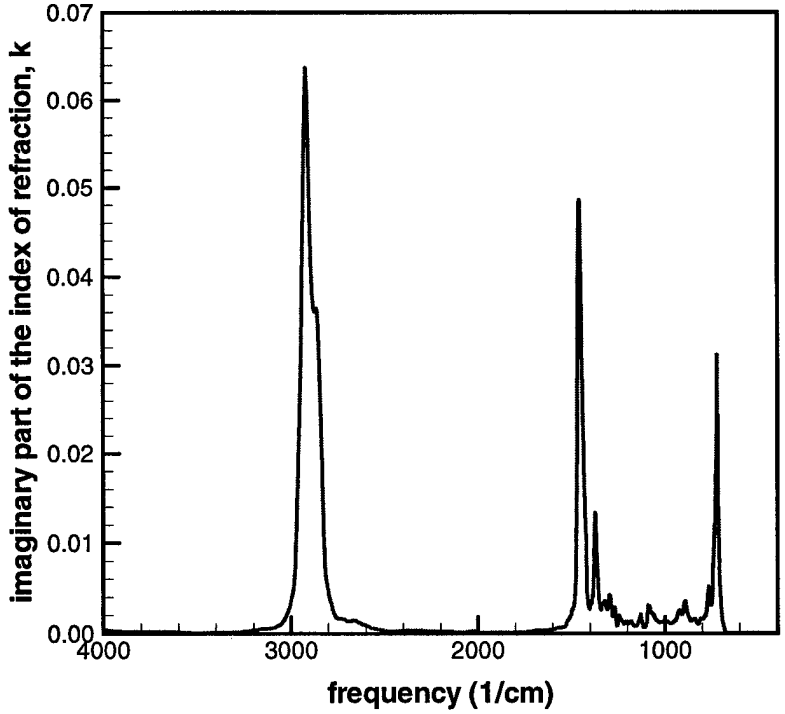

Figure 5.20 Extinction coefficient for n-decane

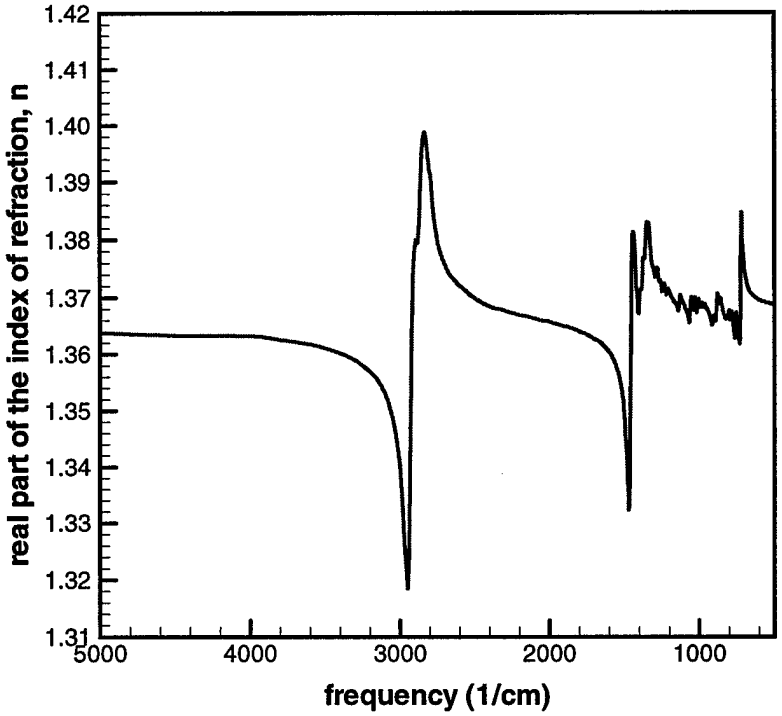

Figure 5.21 Real part of the index of refraction for n-hexane

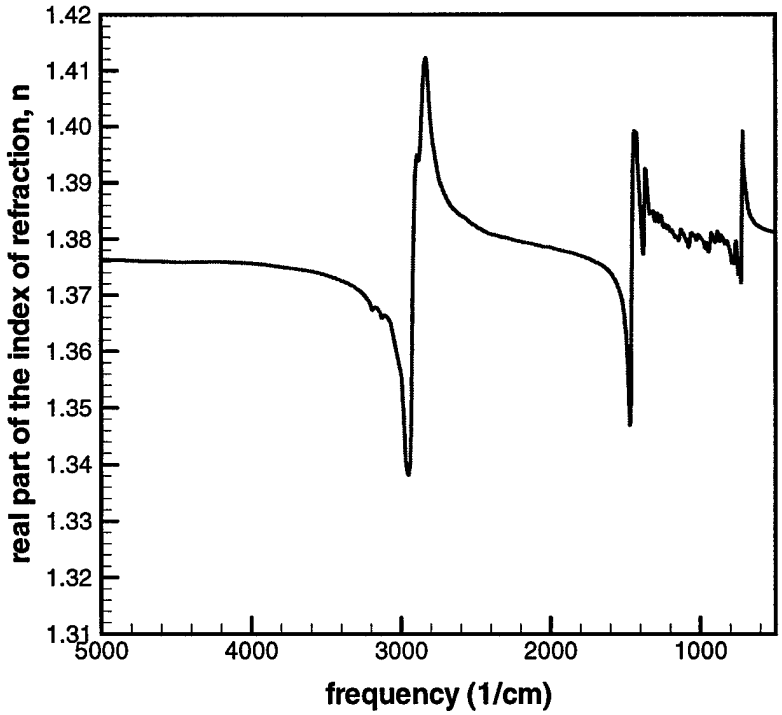

Figure 5.22 Real part of the index of refraction for n-heptane

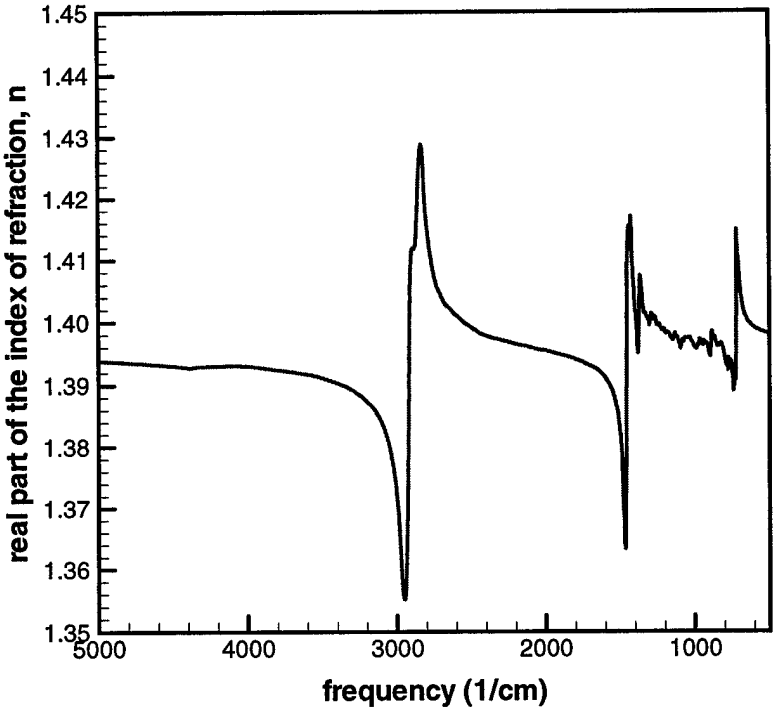

Figure 5.23 Real part of the index of refraction for n-nonane

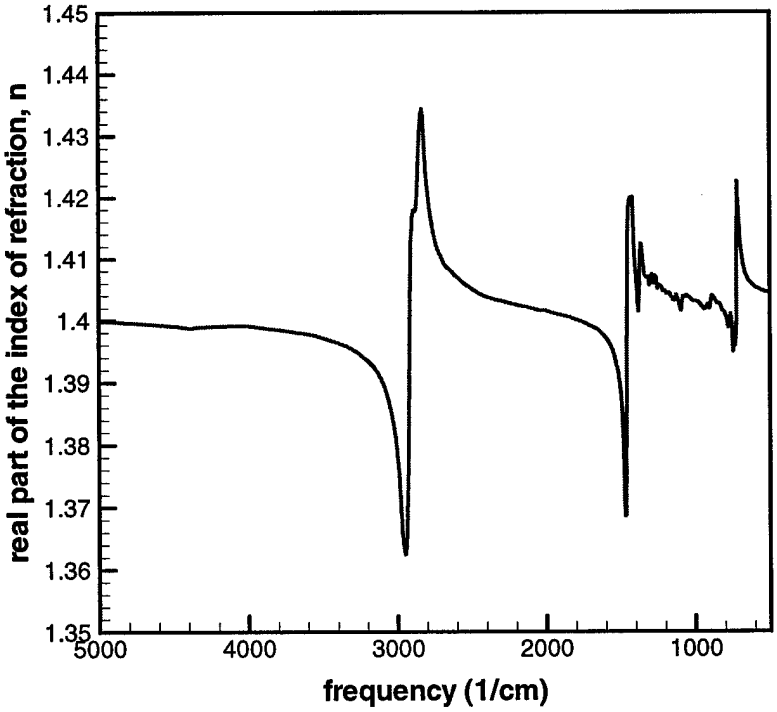

Figure 5.24 Real part of the index of refraction for n-decane

910 cm^{-1} (10.99 μm). This second absorption band produces an extinction coefficient that is almost three times greater than the extinction coefficient caused from the first absorption band. The large extinction coefficient causes a relatively large change in the value of the real part of the refractive index.

5.3 AROMATIC

The results for the aromatic fuels, o-xylene and toluene, are presented in Figures 5.29 through 5.36. The transmittance curves are shown in Figures 5.29 and 5.30. The absorption coefficients and extinction coefficients are shown in Figures 5.31 and 5.32. The real part of the index of refraction is presented in Figures 5.33 and 5.34.

Because of insufficient beam intensity at the far end of the experimental data range, the strongest absorption bands for both of the aromatic fuels could not be measured. The o-xylene absorption band located at 741 cm^{-1} (13.50 μm) and the toluene absorption band located at 728 cm^{-1} (13.75 μm) were approximated using the API data as a guide. The absorption coefficient could not directly calculated from the API data since the transmittance level was recorded as zero at the peaks of both of these absorption bands. To approximate the strength of the bands, a transmittance value of 0.0001 was assigned to the experimental data at the center of each of these absorption bands. This produced an absorption coefficient of just over 6000 cm^{-1}, and an extinction coefficient of over 0.6.

Toluene has another very strong absorption band that is outside the experimental data region, located at 465 cm^{-1} (21.50 μm). The API data was used to determine the absorption coefficient at this location. The data was included in the spectrum used to

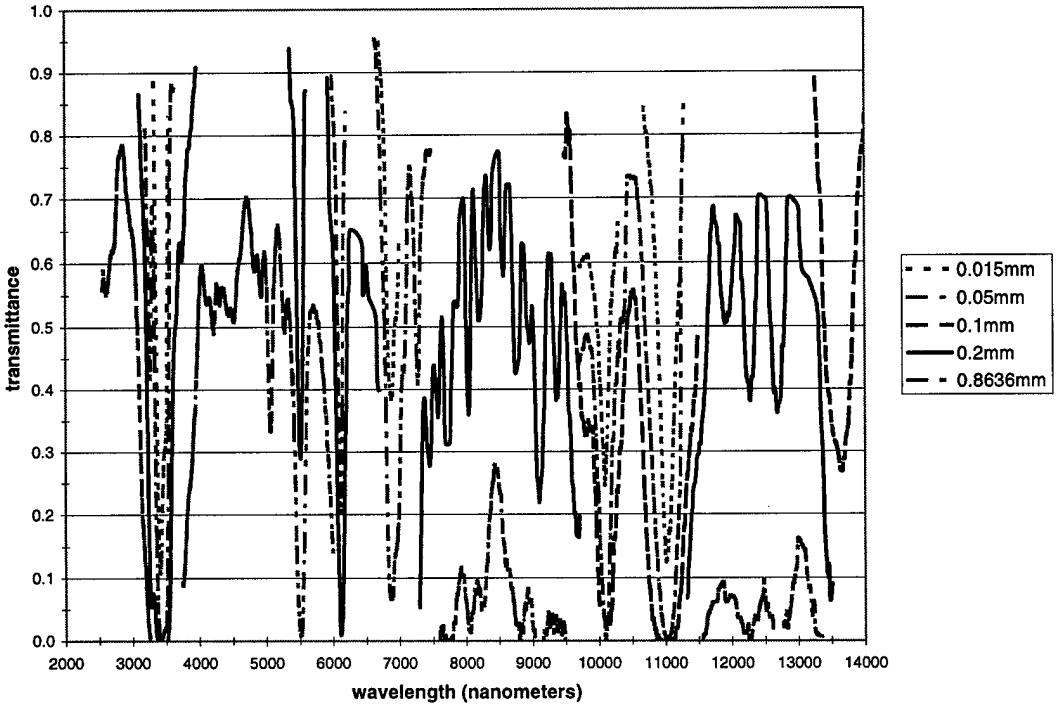

Figure 5.25 Transmittance of 1-hexene

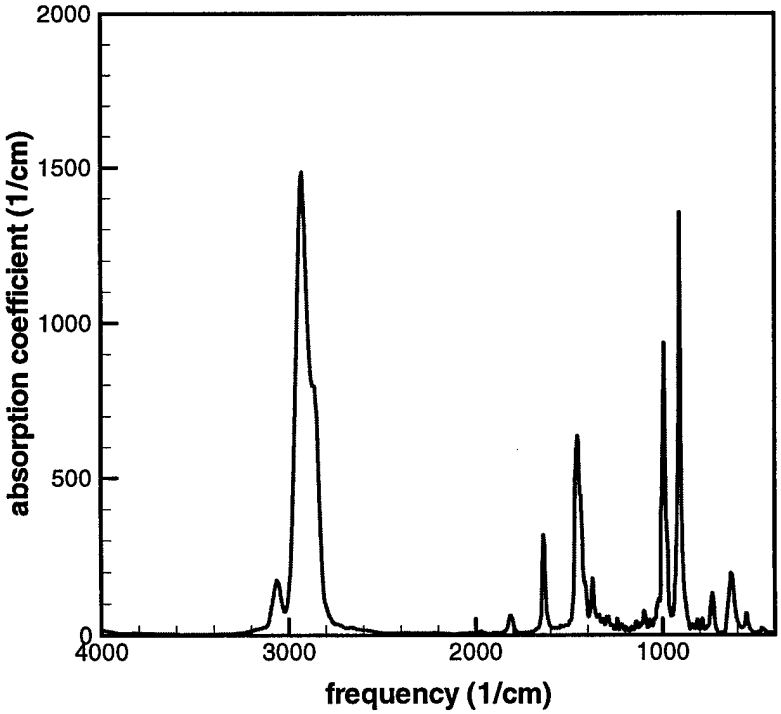

Figure 5.26 Absorption coefficient for 1- hexene

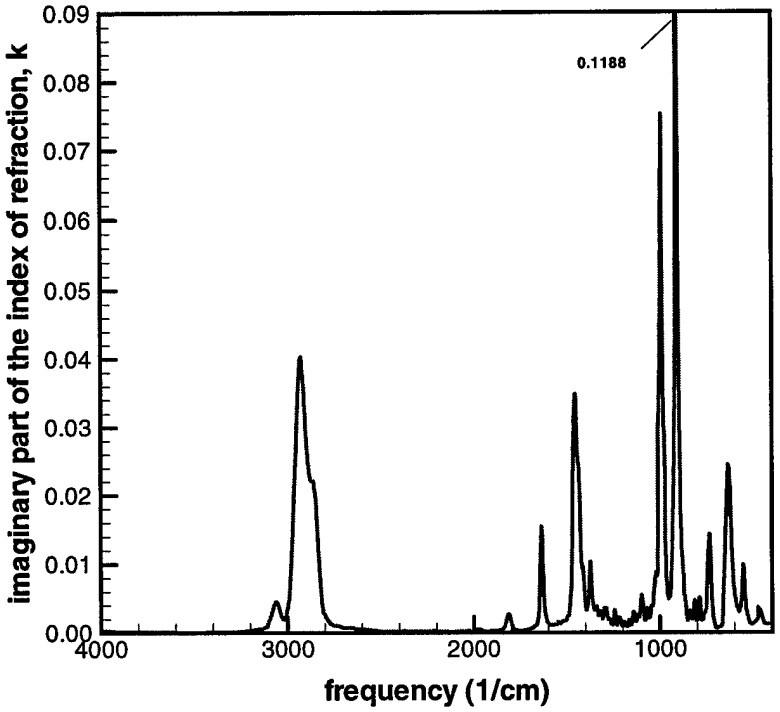

Figure 5.27 Extinction coefficient for 1-hexene

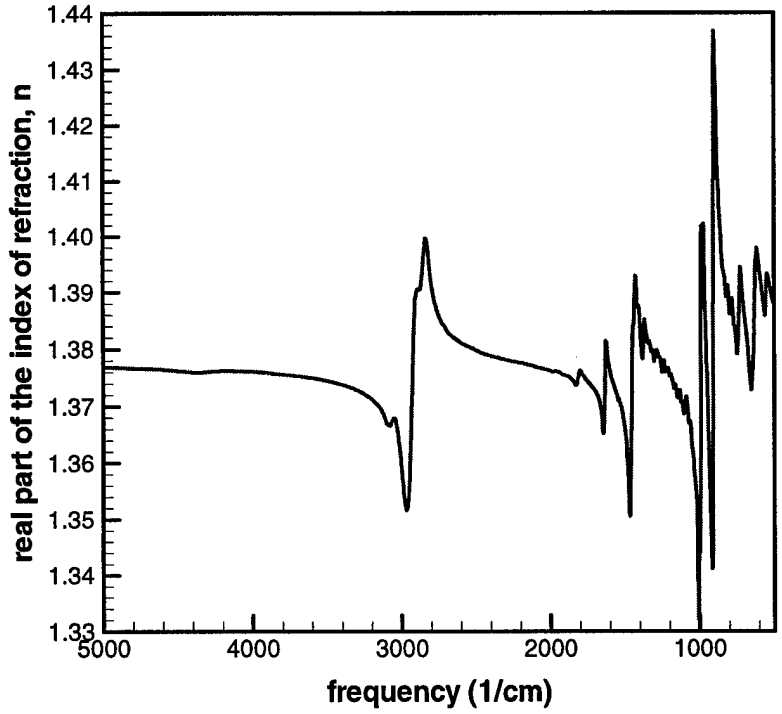

Figure 5.28 Real part of the index of refraction for 1-hexene

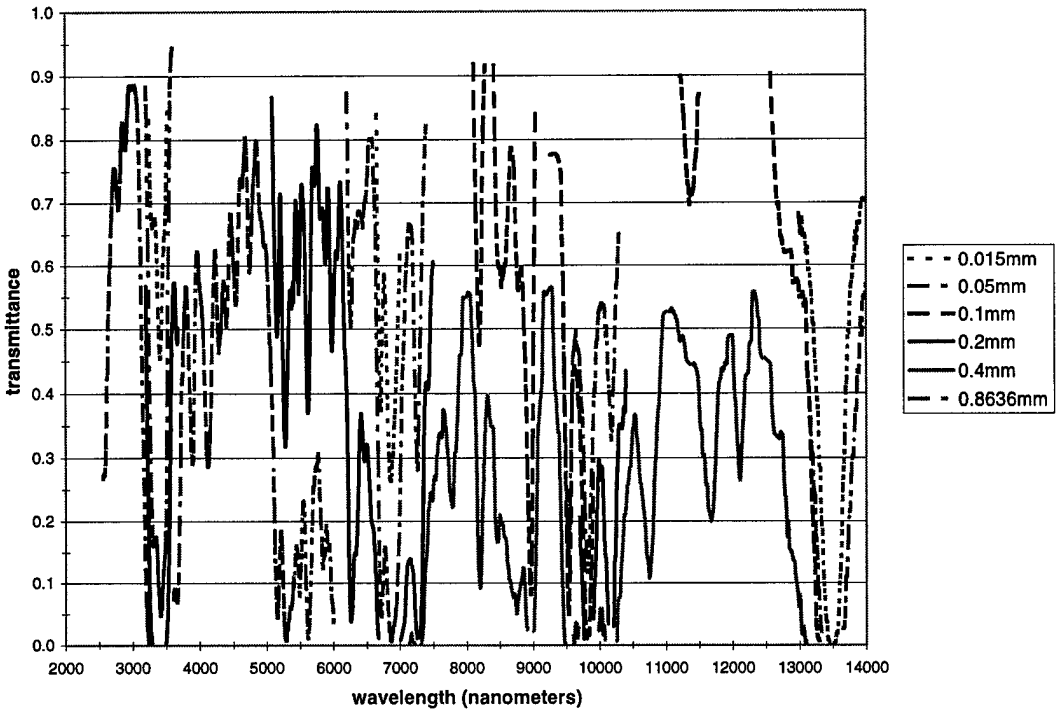

Figure 5.29 Transmittance of o-xylene

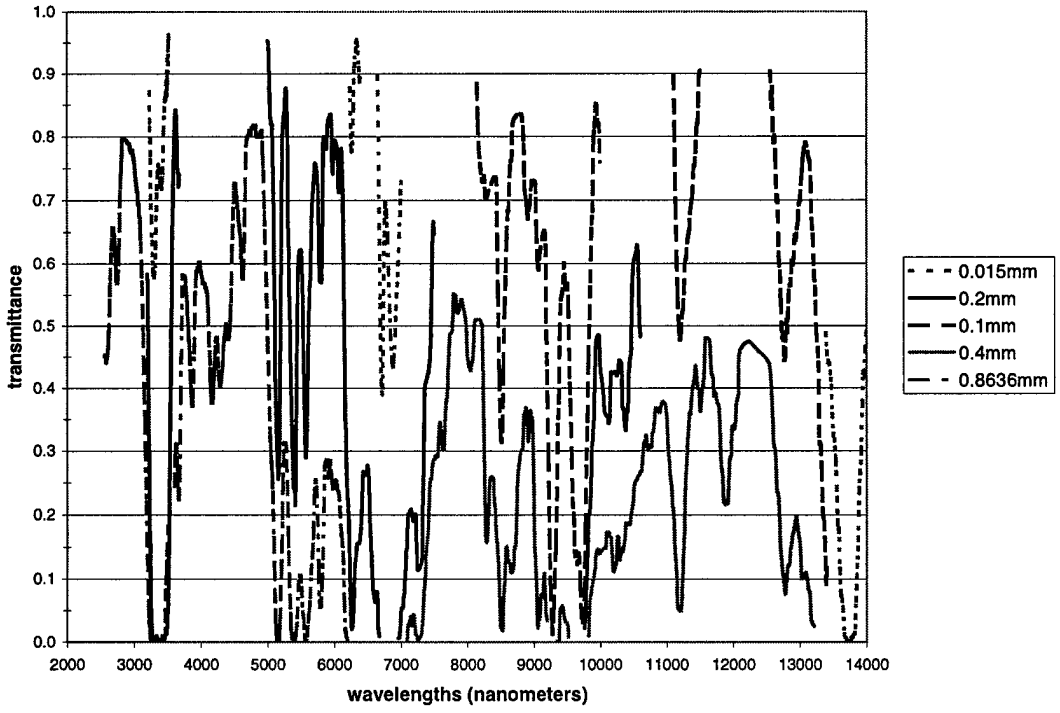

Figure 5.30 Transmittance of toluene

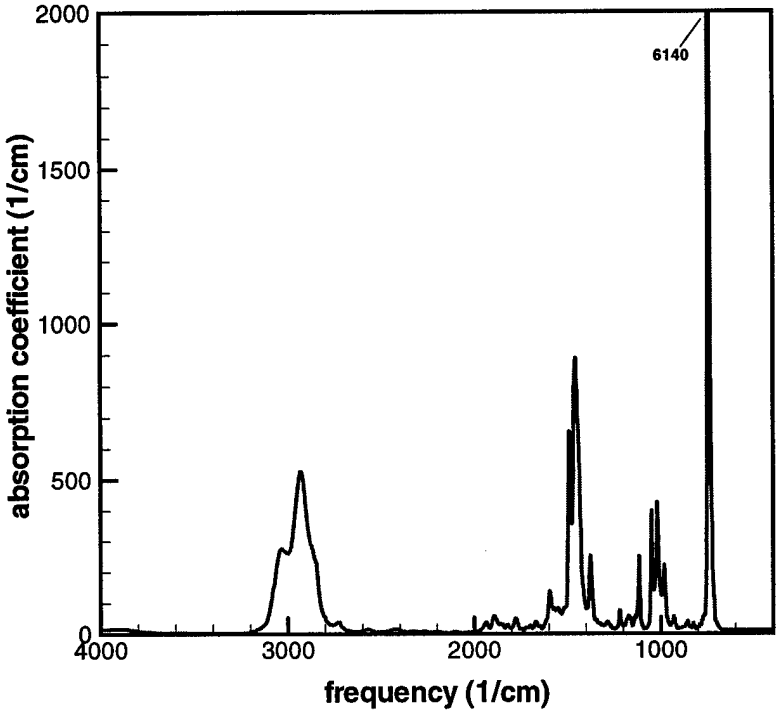

Figure 5.31 Absorption coefficient for o-xylene

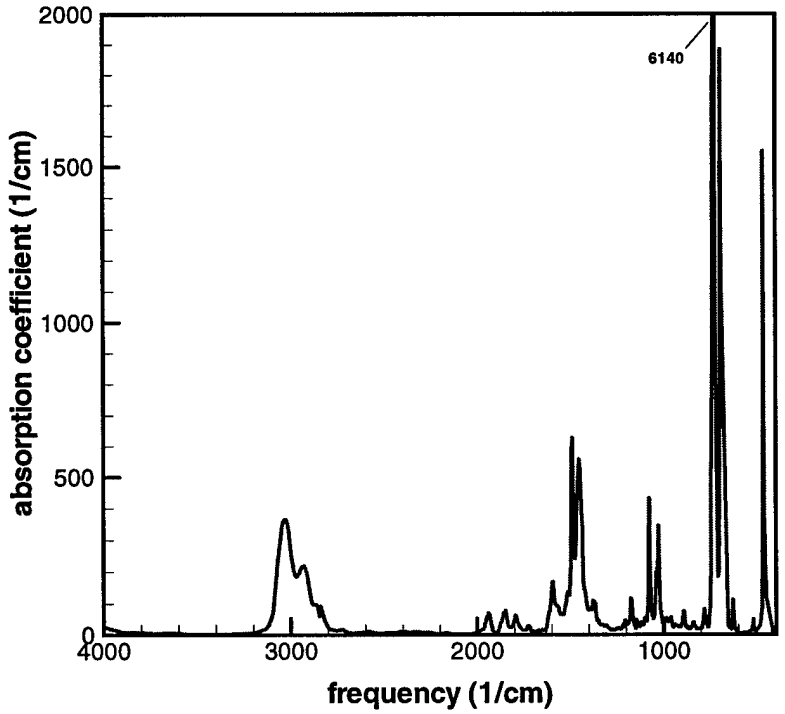

Figure 5.32 Absorption coefficient for toluene

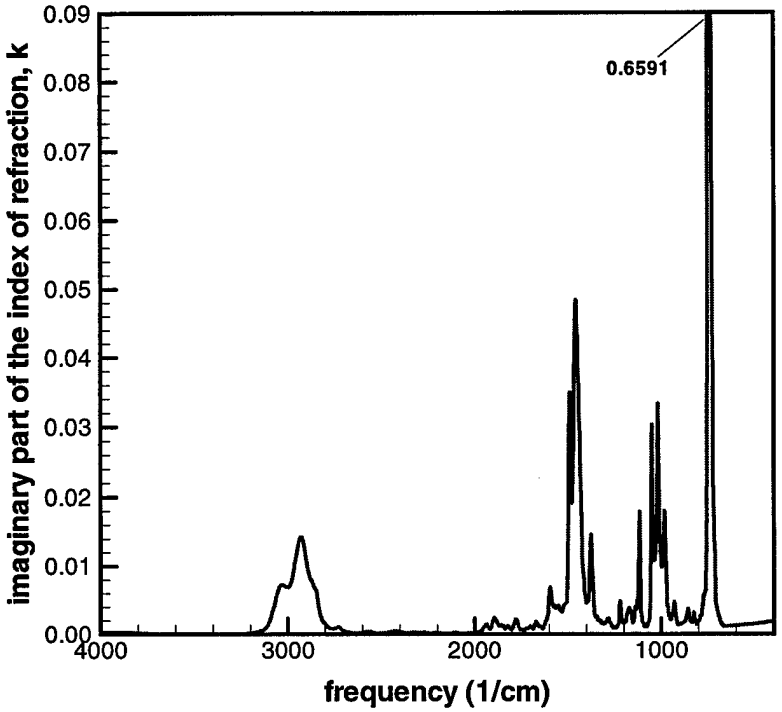

Figure 5.33 Extinction coefficient for o-xylene

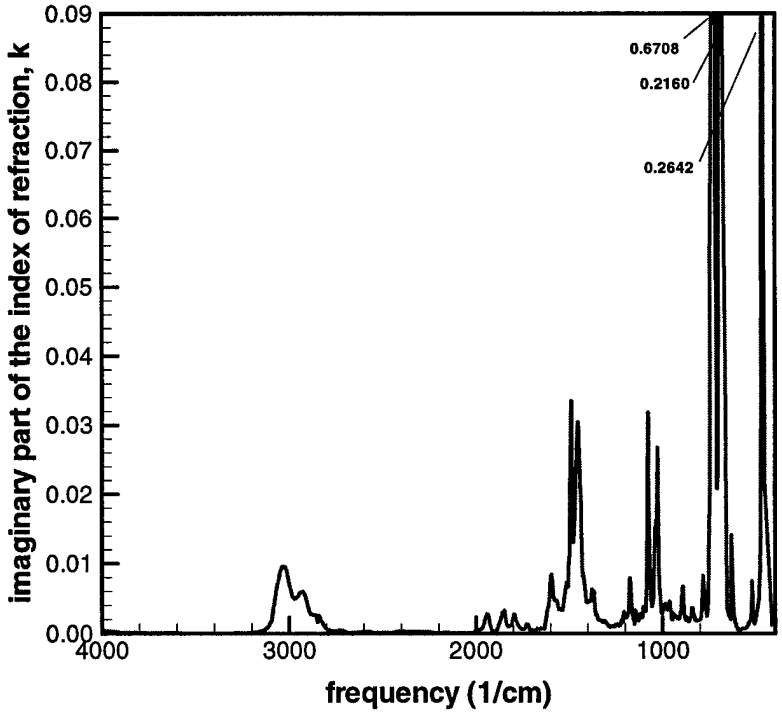

Figure 5.34 Extinction coefficient for toluene

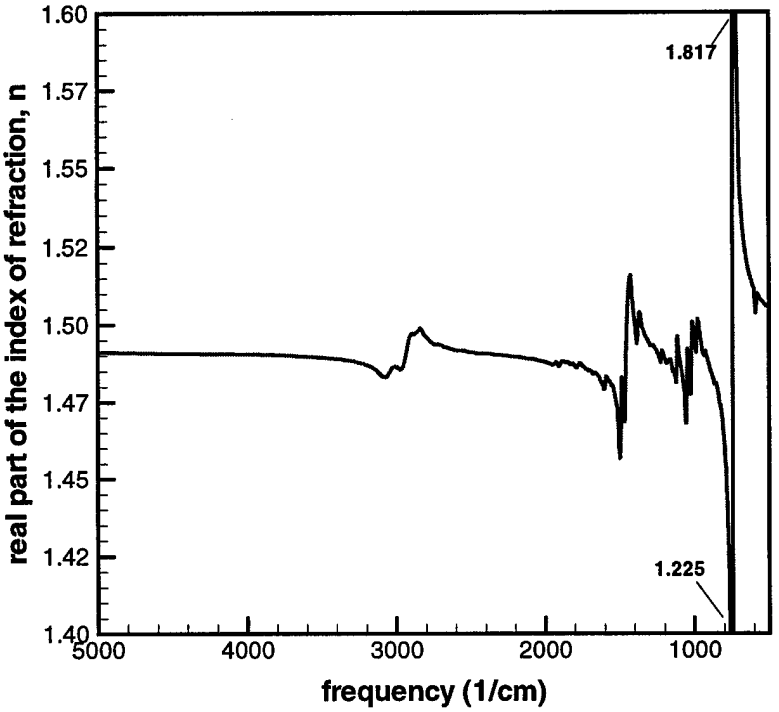

Figure 5.35 Real part of the index of refraction for o-xylene

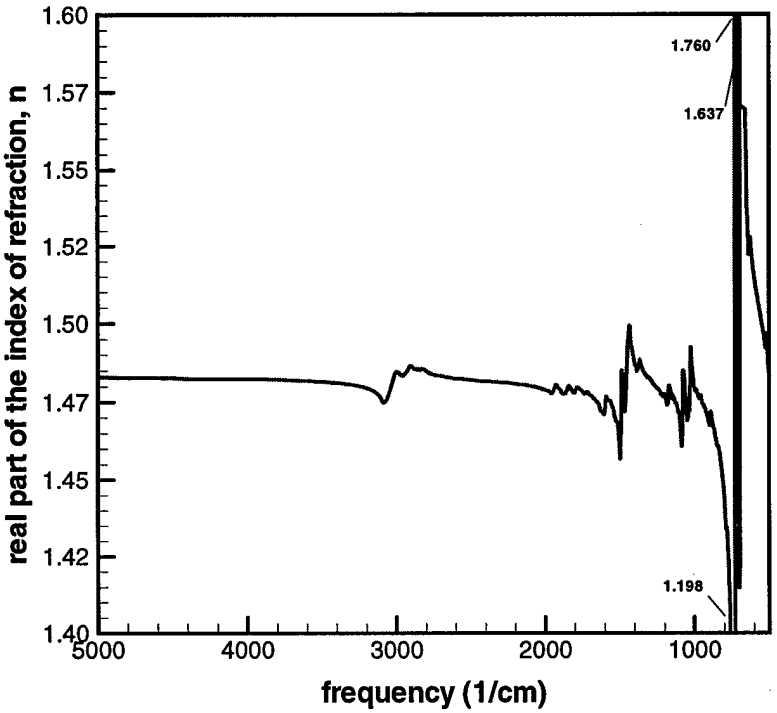

Figure 5.36 Real part of the index of refraction for toluene

calculate the value of the real part of the refractive index because it produces a significant fluctuation. This demonstrates how absorption bands at low frequencies more significantly affect the real part of the index of refraction versus the affect of a same strength absorption band at higher frequencies.

6. CONCLUSIONS AND RECOMMENDATIONS

The optical constants have been determined for nine single component hydrocarbon fuels in the infrared region of 2.0-15.0 μm (5000-667 cm^{-1}). An experimental protocol has been developed that can be used to determine infrared optical constants of other liquids at a later date. Comparisons to existing quantitative data showed that the extinction coefficient for iso-octane is in excellent agreement with the value determined by Drallmeier and Peters [5] at 3.39 μm (2950 cm^{-1}). The 5% difference between the values further validates the experimental results beyond the validation done with water. This close agreement increases the confidence of the experimental results since, in areas of strong absorption, reflectance measurements can generally produce more accurate results than transmittance measurements. The absorption coefficient curve for iso-octane matches very well with the curve produced from API data. This shows that the experimental set-up was properly aligned.

Comparisons with the API data shows that the absorption coefficient may be under determined by as much as 20% in high frequency regions and as much as 50% in the lower frequency regions. This is primarily due to the size of the spectral slit width used on the monochromator, but the accuracy of the thin teflon spacers can also significantly impact the experimental results. The 20% estimated uncertainty in the thin spacers allows for a large error range in the experimental results in the vicinity of the strong absorption bands.

The experiment highlights the difficulty in accurately measuring weak infrared signals the and the continuous balance that must be achieved between spectral slit width size and signal to noise ratio. The bandwidth used in the experiment was reduced to the

smallest size that could still produce an acceptable signal to noise ratio. At high frequencies, an under determination in the absorption coefficient will produce a similar under determination in the extinction coefficient. However, at low frequencies, the extinction coefficient will be significantly more underdetermined if the strength of the absorption band is under measured.

Since the extinction coefficient is used in determining the drop optical thickness in laser extinction techniques, the use of an extinction laser in the high frequency range of the infrared spectrum is recommended. The values at 3.39 μm (2950 cm^{-1}) were of particular interest since they can be used in current laser extinction technique experiments. For most hydrocarbon fuels, the strongest absorption band is located in the higher frequency region of the infrared. Although the strongest absorption band for the aromatic fuels is located in the low frequency region, the absorption band located between 3075 – 2855 cm^{-1} (3.25-3.50 μm) is sufficiently strong enough for use with the laser extinction technique. Additionally, because of a better signal to noise ratio that was present at the higher frequency (lower wavelength) region, the confidence in the values of the determined extinction coefficients at this location is much greater.

Because the real part of the index of refraction is less sensitive to an under measurement of the strength of an absorption band, the estimated error in the results is less than 5% in the high frequency region. This amount of accuracy is more than satisfactory for Mie theory calculations. Two factors show the most influence on the calculation of the real part of the index of refraction. First, the location in the infrared spectrum of strong absorption bands. If the location of the bands is not properly determined, i.e., the location is shifted slightly, the large changes in the value of the real

part of the index of refraction will also shift. Also, strong absorption bands in the lower frequency (higher wavelength) regions have a greater impact than absorption bands in the high frequency regions. Second, the reference value chosen to converge the Kramers-Kronig calculation. If the value is located in an absorption band, the Kramers-Kronig method will produce erratic results that do not physically make sense, e.g., a negative value. If the accuracy of the reference value is poor, this error is passed directly onto the calculations, causing all of the values to be either too high or too low.

The current experimental set-up produced excellent results in low absorbing regions. In highly absorbing regions, the results are satisfactory, but improvements made to increase the accuracy of the measurements will further increase the confidence of the results. Since hydrocarbon fuels possess many narrow strong absorption bands in various locations throughout the infrared spectrum, a smaller bandwidth on the monochromator will increase the accuracy of the measured strength of these narrow absorption bands. Simply decreasing the resolution between measurements will have no affect if the resolution size is smaller than the bandwidth. The larger the bandwidth, the larger the available spectral slit width for each scan. Decreasing the spectral slit width will increase the accuracy of the resolution of the monochromator. Unfortunately, size of bandwidth has a dramatic impact on the magnitude of the intensity of the radiant beam. To achieve a smaller bandwidth and still maintain a good signal to noise ratio, some minor changes must be made to the experimental set-up.

The first option would be to replace the globar in the monochromator illuminator with one that emits more intensity. An Oriel 6363 140-watt emitter produces irradiance that is two orders of magnitude greater than the 9-watt globar used in the illuminator.

Using this new globar would require a different monochromator illuminator. The current illuminator can not provide the required power for a globar that can emit more intensity. An Oriel 60963 monochromator illuminator is required to power the 6363 emitter.

A second option would be to replace the monochromator illuminator with an Oriel 80007 modular silicon carbide infrared light source. Figure 6.1 shows the schematic of the recommended changes for this option. The silicon carbide source is designed to provide an infrared source to an FTIR spectrometer. The irradiance of this glower is the same as the globar in the current illuminator. The improvement in intensity comes from the parabolic reflector inside the silicon carbide source. Since the reflector allows the source to emit a collimated beam, the collimating optics can be removed from the experimental set-up. Approximately 50% of the radiant intensity is lost when the beam passes through the collimating optics (the AMTIR lens and the ZnSe lens both transmit about 70% of the radiation). Additionally, the overall distance of the light path can be decreased when the collimating optics are removed from the system. The decreased path length will result in an increased intensity at the infrared detector. The filter wheel and optical chopper have switched positions, but this will not affect the set-up as long as the filter wheel remains on the entrance side of the monochromator. The reason for the switch is to allow a vent for the light source. The sample cell is placed in between the light source and the monochromator. This allows the infrared detector to be placed adjacent to the exit opening of the monochromator. Also, by keeping the filter wheel before the sample cell, any effects of thermal heating continue to be minimized. These changes would produce a better signal to noise ratio and allow for a decreased bandwidth to be used across the experimental data range. Also, the silicon carbide source is half the

cost of a new monochromator illuminator mentioned in the first option. The new monochromator illuminator would still require collimating optics. The transmittance cut-off for the optics is very close to 15 μm. Without the collimating optics, enough signal intensity will be available to overcome the affect of the CO_2 atmospheric absorption band located at 14.95 μm (668 cm^{-1}).

A smaller teflon spacer, one which is half the thickness of the 0.015 mm spacer will be required to accurately measure the strong absorption band for o-xylene and toluene located at 13.5 μm and 13.75 μm (741 cm^{-1} and 727 cm^{-1}), respectively. This spacer will have to be specially made, but it would provide higher transmittance and thus more reliable values at the strongest absorption bands.

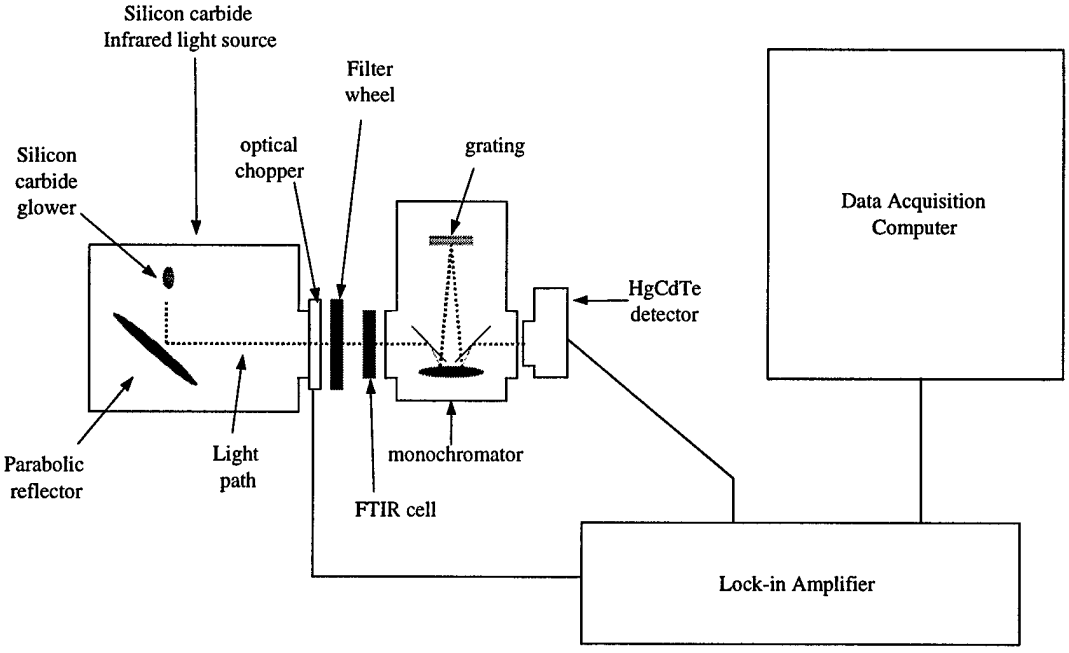

Figure 6.1 Schematic of recommended changes to experimental set-up

APPENDIX A.

COMPUTER PROGRAMS

Kramers-Kronig Program

This QuickBasic program calculates the real part of the index of refraction using absorption data.

```
'Kramers-Kronig Program
'       Michael R. Anderson
'       January 2000
'This program calculates the real part of the index of refraction, n, using
'the Kramers-Kronig method. the absorption coefficient must be known across the entire
'wavelength region.  Data values are read in from low frequency to high frequency.

'                   Variable List
'ND          number of data points in experimental set
'w(I)        wavelength at point I
'a(I)        extinction coefficient at frequency w(I)
'n(I)        real coefficient at frequency w(I)
'F(I)        integrand value at frequency I
'Lower       contribution from lower wing
'Upper       contribution from upper wing
'delta       offset for the experimental upper and lower boundaries
'derr        derrivative of a(I) wrt w(I)
'Ftotal      contribution from the experimental values
'constant    iterative constant
'wH          high end hypothetical frquency
'deln(I)     ultraviolet adjustment to n(I)

'                       MAIN PROGRAM
DEFDBL A-Z
CLS
wH = 100000
constant = .3926
delta = .00001
pi = 3.141592653589793#
DIM w(5000), a(5000), n(5000), F(5000)
DIM deln(5000)
D$ = "c:\Anderson\thesis\octanea.txt"
B$ = "c:\Anderson\thesis\omegaoct.txt"
OPEN D$ FOR INPUT AS #3:'absorption coefficient values
OPEN B$ FOR INPUT AS #2:'frequencies which correspond to absorption coefficients
z = 1
WHILE NOT EOF(2)
        INPUT #2, w(z)
        INPUT #3, a(z)
        z = z + 1
WEND
CLOSE #2
CLOSE #3
E$ = "c:\Anderson\thesis\octane.txt"
OPEN E$ FOR OUTPUT AS #2
PRINT #2, "variables = "; CHR$(34) + "frequency" + CHR$(34); ", "; CHR$(34) + "n(v)" + CHR$(34); ", ";
CHR$(34) + "alpha" + CHR$(34)
nd = z - 1
n(2954) = 1.5
WHILE n(2954) > 1.404:' this is the data point at 16960 1/cm where you know the value of n for the fuel
FOR i = 1 TO nd
        GOSUB wing: 'calculate wing contribution
        GOSUB trap: ' calculate integrand contributions, F
        GOSUB real: '  calculate real coefficient, n
NEXT i
constant = constant - .00005
```

```
WEND
        GOSUB results: ' output
CLOSE #2
END

wing:           ' wing contribution subroutine
        lower = (a(i) / (4 * (pi ^ 2) * w(i))) * LOG(((w(i) + w(1) + delta) / (w(i) - w(1) + delta)))
        upper = (a(i) / (4 * (pi ^ 2) * w(i))) * LOG((((w(nd) + delta) - w(i)) / ((w(nd) + delta) + w(i))))
RETURN

trap: 'F  contributions
FOR j = 1 TO nd
        IF i = j AND i = 1 THEN
            GOSUB forward
        ELSEIF i = j AND i = nd THEN
            GOSUB backward
        ELSEIF i = j THEN
            GOSUB central
        ELSE
            F(j) = (a(j) - a(i)) / ((w(j)) ^ 2 - (w(i)) ^ 2)
        END IF
NEXT j
'perform trapezoidal rule
Ftotal = 0
FOR k = 1 TO nd
        Fpart = (F(k) + F(k + 1)) * (w(k + 1) - w(k)) / 2
        Ftotal = Ftotal + Fpart
NEXT k
RETURN

real: ' real index calculation
        correct = F(1) + F(nd)
        deln(i) = constant / (1 - (w(i) / wH) ^ 2)
        n(i) = 1 + deln(i) + lower + upper + (1 / (2 * pi ^ 2)) * (Ftotal + correct * delta)
RETURN

results: ' output results
FOR i = 1 TO nd
        PRINT #2, USING "######.##     ###.########     #######.######"; w(i); n(i); a(i)
NEXT i
RETURN

forward: '
        derr = (a(i + 1) - a(i)) / (w(i + 1) - w(i))
        F(j) = (derr) / (2 * w(i))
RETURN

backward: '
        derr = (a(i) - a(i - 1)) / (w(i) - w(i - 1))
        F(j) = (derr) / (2 * w(i))
RETURN

central: '
        derr = (a(i + 1) - a(i - 1)) / (w(i + 1) - w(i - 1))
        F(j) = (derr) / (2 * w(i))
RETURN
```

Subtractive Kramers-Kronig Program

This QuickBasic program calculates the real part of the index of refraction using the subtractive Kramers-Kronig method.

```
'       Subtractive Kramers-Kronig Program
'       Michael R. Anderson
'       January 2000

'This program calculates the real part of the index of refraction, n, using
'the subtractive Kramers-Kronig method.  A reference value for n must be known
'and the value of alpha, the absorption coefficient must be known across the entire
'wavelength region.

'       Variable List
'nd      number of data points in experimental set
'w(i)     wavelength at point i
'a(i)    absorption coefficient at frequency w(i)
'n(i)    real coefficient at frequency w(i)
'no      reference real coefficient
'wo      frequency of the reference coefficient
'ao      absorption coefficient at the reference frequency
'F(i)    integrand value at wavelength i
'E(i)    integrand value at wavelength i
'Lower     contribution from lower wing
'Upper     contribution from upper wing
'delta    offset for the experimental upper and lower boundaries
'correct   correction term when the frequency is at the experimental boundary
'derr     derivative of a(i) wrt w(i)
'Ftotal   contribution from the experimental values
'Etotal   contribution from experimental values

'       MAIN PROGRAM
' dimension variables
DEFDBL A-Z
CLS
ao = 69.2
no = 1.303
wo = 5000
delta = .01
pi = 3.141592653589793#

DIM w(2000), a(2000), n(2000), F(2000), E(2000)

' input absorption coefficients and frequencies
D$ = "c:\Anderson\thesis\data\warob.txt"
B$ = "c:\Anderson\thesis\data\omega.txt"
OPEN D$ FOR INPUT AS #3
OPEN B$ FOR INPUT AS #2

z = 1
WHILE NOT EOF(2)
 INPUT #2, w(z)
 INPUT #3, a(z)
 z = z + 1
WEND

nd = z - 1
CLOSE #2
CLOSE #3
```

```
E$ = "c:\Anderson\thesis\data\wres6.txt"
OPEN E$ FOR OUTPUT AS #2
PRINT #2, "# frequency              n              alpha"

FOR i = 1 TO nd
 GOSUB wings: ' calculate wing contributions
 GOSUB integrand: ' calculate integrand contributions, F and E
 GOSUB calculate: ' calculate real coefficient, n
NEXT i

 GOSUB results: ' output
CLOSE #2
END

'*****************************************************************
wings: '          wing contribution subroutine
low1 = ((a(i) - a(1)) / (4 * w(i) * pi ^ 2)) * LOG(((w(i) + (w(1) - delta)) / (w(i) - (w(1) - delta))))
low2 = ((ao - a(1)) / (4 * w(i) * pi ^ 2)) * LOG(((wo + (w(1) - delta)) / (wo - (w(1) - delta))))
lower = low1 + low2
up1 = ((a(nd) - a(i)) / (4 * w(i) * pi ^ 2)) * LOG(((w(nd) + delta) - w(i)) / ((w(nd) + delta) + w(i)))
up2 = ((a(i) - ao) / (4 * w(i) * pi ^ 2)) * LOG(((w(nd) + delta) - wo) / ((w(nd) + delta) + wo))
upper = up1 + up2
RETURN

'*****************************************************************
integrand: '        F and E contributions
 FOR j = 1 TO nd
   IF i = j AND i = 1 THEN
     GOSUB forward
   ELSEIF i = j AND i = nd THEN
     GOSUB backward
   ELSEIF i = j THEN
     GOSUB central
   ELSE
     F(j) = (a(j) - a(i)) / ((w(j)) ^ 2 - (w(i)) ^ 2)
  END IF

 IF w(j) = wo THEN
    GOSUB exception
 ELSE
    E(j) = (a(j) - ao) / ((w(j)) ^ 2 - (wo ^ 2))
 END IF
 NEXT j

'        perform trapezoidal rule
Ftotal = 0
Etotal = 0

FOR h = 1 TO (nd - 1)
 Fpart = (F(h) + F(h + 1)) * (w(h + 1) - w(h)) / 2
 Epart = (E(h) + E(h + 1)) * (w(h + 1) - w(h)) / 2
 Ftotal = Ftotal + Fpart
 Etotal = Etotal + Epart
NEXT h
RETURN

'*************************************************
calculate: '              real index calculation
correct = F(1) + F(nd)
n(i) = no + upper + lower + ((1 / (2 * pi ^ 2)) * (correct + Ftotal - Etotal))
RETURN
```

```
'*****************************************************
results: '              output results
FOR q = 1 TO nd
PRINT #2, USING "#####.####     ###.########     ######.############"; w(q); n(q); a(q)
NEXT q
RETURN

'*****************************************************
forward: 'forward difference
derr = (a(i + 1) - a(i)) / (w(i + 1) - w(i))
F(j) = (derr) / (2 * w(i))
RETURN

'*****************************************************
backward: 'backward difference
derr = (a(i) - a(i - 1)) / (w(i) - w(i - 1))
F(j) = (derr) / (2 * w(i))
RETURN

'*****************************************************
central:  'central difference
derr = (a(i + 1) - a(i - 1)) / (w(i + 1) - w(i - 1))
F(j) = (derr) / (2 * w(i))
RETURN

'*****************************************************
exception:
derr = (a(i + 1) - a(i - 1)) / (w(i + 1) - w(i - 1))
E(j) = (derr) / (2 * w(i))
RETURN
```

Data Acquisition Program

This is the Data Acquisition program, which is written in Visual Basic. This program works with the National Instruments PCI E Series Data Acquisition Board and Software

```
Option Explicit
Dim i, j, NumSamps As Integer
Dim ScaledData As Variant
Dim directory, outfile As String

Private Sub cmdDown_Click()
txtdial.Text = Val(txtdial.Text) - 10
End Sub

Private Sub cmdDown2_Click()
txtdial.Text = Val(txtdial.Text) - 2
End Sub

Private Sub cmdUp_Click()
txtdial.Text = Val(txtdial.Text) + 10
End Sub

Private Sub cmdUp2_Click()
txtdial.Text = Val(txtdial.Text) + 2
End Sub

Private Sub Start_Click()
  i = 0
  NumSamps = 30

  directory = txtDirectory.Text
  outfile = directory & txtSubstance.Text & "\" & txtGrating.Text & txtdial.Text & ".txt"
  Open outfile For Output As #10
  CWAI1.Device = DeviceNumEdit.Value
  CWAI1.Channels(1).ChannelString = ChannelStringTextBox.Text
  CWAI1.Configure
  lblStatus.Caption = "Acquiring data..."
  lblStatus.Refresh

  CWAI1.Start

End Sub

Private Sub Stop_Click()
  CWAI1.Stop
End Sub

Private Sub Quit_Click()
  End
End Sub


Private Sub CWAI1_AcquiredData(ScaledData As Variant, BinaryCodes As Variant)
   For j = 0 To NumSamps - 1
    Print #10, Format(ScaledData(j), "#0.000")
```

```
    Next j
    MsgBox "Acquisition finished"

    lblStatus.Caption = ""
    lblStatus.Refresh

    Close #10
End Sub

Private Sub CWAI1_DAQError(ByVal StatusCode As Long, ByVal ContextID As Long, ByVal
ContextDescription As String)
    MsgBox "Error: " & StatusCode & vbCrLf & "Context: " & ContextDescription & vbCrLf &
CWDAQTools1.GetErrorText(StatusCode)
End Sub

Private Sub CWAI1_DAQWarning(ByVal StatusCode As Long, ByVal ContextID As Long, ByVal
ContextDescription As String)
    MsgBox "Warning: " & StatusCode & vbCrLf & "Context: " & ContextDescription & vbCrLf &
CWDAQTools1.GetErrorText(StatusCode)
End Sub
```

Data Reduction Program

This program reduced the individual data files into time averaged values of wavelength and intensity (voltage in volts).

```
'               Michael R. Anderson
'               Data Reduction Program
'               November 1999

CLS
E$ = "C:\Anderson\Thesis\Data\water\empty05.txt"
OPEN E$ FOR OUTPUT AS #2
PRINT #2, "wavelength (nm)     voltage (Volts)"
J$ = "C:\Anderson\Thesis\Data\water\empty05\"
DIM a AS LONG
DIM b AS LONG
     'a is the data file number first 4 digits are grating no,
     'the last four is the wavelength dial number
     ' b is the value to subtract off of x IOT get the wavelength dial
     ' number from the file
DEFDBL C-Z

'               MAIN PROGRAM

FOR x = 1 TO 3
 IF x = 1 THEN
  GOSUB 1000: 'reduction for grating 7301
 ELSEIF x = 2 THEN
  GOSUB 2000: 'reduction for grating 7302
 ELSEIF x = 3 THEN
  GOSUB 3000: 'reduction for grating 7303
 END IF
NEXT x

CLOSE #2
END

'*******************************
1000'
        a = 73013130: ' a is the start dial setting
        b = 73010000
        FOR z = 3130 TO 6470 STEP 10
        ' Z is the dial setting of the monchromater (indicates wavelength)
        vtotal = 0
        IF (z > 6470 AND z <= 6990) THEN GOTO 1050: 'this statement allows for non-consecutive data files
        C$ = LTRIM$(STR$(a)) + ".TXT"
        D$ = J$ + C$
        PRINT a
        OPEN D$ FOR INPUT AS #1
        WHILE NOT EOF(1)
         INPUT #1, v
         vtotal = vtotal + v
        WEND
         CLOSE #1
            'Calculate time averaged voltage reading
            '     Vavg is the time averaged voltage multiplied by the sensitivity factor from the lock-in amplifier
            '     lambda is the wavelength of the voltage.
        Vavg = vtotal / 30
```

```
        IF z < 2500 OR z > 6490 THEN
            Vavg = Vavg * .001
           'ELSEIF (Z >= 3250 AND Z <= 3260) OR (Z >= 8000 AND Z <= 8000) THEN
      ' Vavg = Vavg * .003
    'ELSEIF (Z >= 3270 AND Z <= 3310) OR (Z >= 8000 AND Z <= 8000) THEN
       ' Vavg = Vavg * .01
    'ELSEIF Z >= 3320 AND Z <= 3350 THEN
        ' Vavg = Vavg * .03
    ELSEIF z >= 3130 AND z <= 3170 THEN
        Vavg = Vavg * .1
    ELSEIF (z >= 3180 AND z <= 3310) OR (z >= 5270 AND z <= 6470) OR (z >= 8000 AND z <= 8000) THEN
        Vavg = Vavg * .3
    ELSEIF (z >= 3320 AND z <= 5260) OR (z >= 8000 AND z <= 8000) THEN
        Vavg = Vavg * 1
    END IF

    lambda = (a - b) * .8
    PRINT #2, USING "  #####.##         ####.########"; lambda; Vavg
1050 '
    a = a + 10
    NEXT z
    RETURN

'*****************************************************
2000'
    a = 73023240
    b = 73020000
    FOR y = 3240 TO 5630 STEP 10
    total = 0
    C$ = LTRIM$(STR$(a)) + ".TXT"
    D$=J$+C$
    OPEN D$ FOR INPUT AS #1
    WHILE NOT EOF(1)
     INPUT #1, v
     total = total + v
     WEND
    CLOSE #1
    avg = total / 30

    IF y < 3240 OR y > 5630 THEN
        avg = avg * .01
     ELSEIF (y >= 239 AND y <= 257) OR (y >= 8000 AND y <= 8000) THEN
        avg = avg * .03
     ELSEIF (y >= 3240 AND y <= 4760) OR (y >= 5200 AND y <= 5630) THEN
        avg = avg * 1
     ELSEIF (y >= 3240 AND y <= 3300) OR (y >= 7000 AND y <= 8000) THEN
         avg = avg * .3
     ELSEIF y >= 4770 AND y <= 5190 THEN
        avg = avg * 3
    END IF

        lambda = (a - b) * 1.6
        PRINT #2, USING "  #####.##         ####.########"; lambda; avg
        a = a + 10
        NEXT y
RETURN

'*****************************************************
3000'
        a = 73033760
        b = 73030000
        FOR z = 3760 TO 6250 STEP 10
```

```
        vtotal = 0
        C$ = LTRIM$(STR$(a)) + ".TXT"
        D$ = J$ + C$
        OPEN D$ FOR INPUT AS #1
         WHILE NOT EOF(1)
           INPUT #1, v
           vtotal = vtotal + v
         WEND
        CLOSE #1
        Vavg = vtotal / 30

         IF z < 3140 OR z > 6250 THEN
            Vavg = Vavg * .01
         ELSEIF (Z >= 8000 AND Z <= 8000) OR (Z >= 8000 AND Z <= 8000) THEN
            Vavg = Vavg * .03
         ELSEIF (z >= 3760 AND z <= 3880) OR (z >= 5060 AND z <= 5670) THEN
            Vavg = Vavg * 1
         ELSEIF (z >= 5680 AND z <= 6250) THEN
            Vavg = Vavg * .3
         ELSEIF z >= 3890 AND z <= 5050 THEN
            Vavg = Vavg * 3
         END IF

         lambda = (a - b) * 2.4
         PRINT #2, USING "  #####.##          ####.########"; lambda; Vavg
         a = a + 10
        NEXT z

RETURN
```

APPENDIX B.

OPERATING PROCEDURE

1. Turn on integrated infrared light source and power supply. Set current to 2.00 amps. When turning off light source, set current back to zero before switching off power to prevent a power surge that might damage the globar the next time the light source is turned on.

2. In order to match the acceptance cone of the monochromator, the image of the globar is focused onto the entrance slit of the monochromator. The distance between the exit flange of the light source and the entrance slit of the monochromator must be 3.2 inches.

3. Turn on optical chopper and set chopping frequency to any non-multiple of 60 Hz. A chopping frequency of 100 Hz was used in the experiment.

4. Slowly fill the infrared detector with liquid nitrogen using the funnel. This process may take several minutes as the liquid nitrogen cools the dewar to 77 K. If the signal pre-amplifier is needed, place the switch on the back of the detector to the up position.

5. Turn the lock-in amplifier on and set to the following:

Float/Ground switch	ground
track filter	on
line filter	on
time constant	0.1 sec, 6 db
x10 expand	on (if required)
sensitivity	adjusted to keep readout between 3 and 10

The time constant must match the sampling speed of the data acquisition program.

6. Place the empty sample cell into the cell holder and lock into place.

7. Set the phase on the lock-in amplifier to attain the maximum positive output. The maximum signal is generally reached by setting the monochromator to the blaze wavelength for the particular grating. Advance the reference phase 270° by pressing the +90° key three times. Adjust the phase arrow keys until the output display reads zero. Once zero is achieved, press the +90° once more. The signal and reference are exactly in phase at the input of the detector.

8. Scan background noise. Position the filter wheel to the stop position, blocking the light beam to the monochromator. In this experiment, ten samples were taken. A typical dial setting in the 9000s range was used for background measurements. Background measurements should be taken at the lowest signal multiplier as possible.

9. Set the filter wheel to the lowest cutoff filter. Filter cutoffs are listed in table B.1.

Table B.1 Long-Pass Filter Specifications

Wheel Position	cutoff wavelength (nm)	maximum transmittance (nm)
1	2500	5000
2	3500	7000
3	6000	12000
4	8500	15000
5	stop	n/a

10. Scan the empty cell over the wavelength range of the grating in the monochromator. Increment scan by one dial number. Ranges used in the experiment are listed in table B.2. Scan cell with luer lock plugs in place. While scanning, change long-pass filters as necessary to block higher order wavelengths.

Table B.2 Grating Specifications

Grating number	Blaze wavelength (μm)	Usable wavelength range (μm)	Range used in experiment (μm)	Monochromator dial range	Wavelength counter multiplier
77301	4	2.5-8.0	2.504-5.400	320-675	8
77302	7	4.5-16	5.408-14.000	338-875	16

11. Scan empty cell over grating ranges. Interchange gratings as required. Once scan is complete, scan background noise again by setting filter wheel to the stop position. Remove cell from holder and fill cell with sample fluid using syringe. Replace luer lock plugs and return cell to cell holder.

12. Scan background noise with filled cell. Scan filled cell over the same wavelength ranges as the empty cell. In regions of rapidly changing spectrum, the dial can be incremented five times as much. If this is done, either the empty cell must also be scanned at the same increment, or the empty cell data can be interpolated between data points. When scan is complete, scan background noise again.

13. Remove filled cell from cell holder. Evacuate cell using vacuum pump. Dry any remaining fluid with dry nitrogen. Disassemble cell and change teflon spacer. Clean any leftover residue from cell windows. Repeat process with new cell thickness.

14. Reduce raw data using data reduction computer program. Average the reduced background scan readings to use in calculation of transmittance. Transmittance, absorption coefficients and extinction coefficients are calculated using a spreadsheet. Blending the absorption coefficients into a continuous curve forms the absorption

coefficient curve. Selection of the absorption coefficient values is based on the protocol explained in Section 3.

15. Plot raw intensity values for both the filled and empty cells. These plots will show where adjustments may need to be made to correct for anomalies caused by atmospheric absorption, constructive and destructive interference, and Woods anomalies and ghosts in the grating.

16. Data files for the Kramers-Kronig program are produced from the spreadsheet data. Data must be in increasing frequency order. Additional data outside the experimental range is produced on the spreadsheet using the assumptions of the behavior of the extinction coefficient or the absorption coefficient.

APPENDIX C.

OPTICAL CONSTANTS

ISO-OCTANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
434.78	1.392	0.0011522	6.295	23.000
444.21	1.387	0.0013305	7.427	22.512
454.31	1.386	0.0016962	9.684	22.011
464.36	1.386	0.0012847	7.496	21.535
474.35	1.385	0.0007931	4.727	21.081
484.23	1.386	0.0006056	3.685	20.651
494.54	1.386	0.0005592	3.475	20.221
504.45	1.386	0.0004915	3.116	19.824
514.53	1.386	0.0004359	2.819	19.435
524.37	1.386	0.0003548	2.338	19.071
534.49	1.386	0.0002655	1.783	18.709
535.49	1.386	0.0002516	1.693	18.674
536.83	1.386	0.0002443	1.648	18.628
538.17	1.386	0.0002370	1.603	18.581
539.52	1.386	0.0002298	1.558	18.535
541.56	1.386	0.0002224	1.514	18.465
554.84	1.386	0.0002107	1.469	18.023
561.43	1.386	0.0002146	1.514	17.812
563.29	1.386	0.0002201	1.558	17.753
564.78	1.386	0.0002259	1.603	17.706
566.29	1.386	0.0002316	1.648	17.659
566.67	1.386	0.0002377	1.693	17.647
568.94	1.386	0.0002431	1.738	17.577
577.45	1.386	0.0002520	1.829	17.318
584.19	1.386	0.0002615	1.920	17.118
589.44	1.386	0.0002530	1.874	16.965
595.16	1.386	0.0002445	1.829	16.802
598.47	1.386	0.0002371	1.783	16.709
602.66	1.386	0.0002295	1.738	16.593
606.92	1.386	0.0002161	1.648	16.477
612.54	1.386	0.0002082	1.603	16.325
621.39	1.386	0.0002110	1.648	16.093
627.77	1.386	0.0002146	1.693	15.929
630.10	1.386	0.0002195	1.738	15.870
644.43	1.387	0.0002090	1.693	15.518
648.36	1.387	0.0002022	1.648	15.424
654.35	1.387	0.0001895	1.558	15.282
664.06	1.387	0.0001761	1.469	15.059
674.42	1.387	0.0001682	1.425	14.828
684.50	1.387	0.0001606	1.381	14.609
694.89	1.387	0.0001632	1.425	14.391
704.45	1.387	0.0001811	1.603	14.195
714.29	1.387	0.0001290	1.158	14.000
715.10	1.387	0.0001288	1.158	13.984
715.92	1.387	0.0001287	1.158	13.968
716.74	1.387	0.0001285	1.158	13.952
717.57	1.387	0.0001284	1.158	13.936
720.05	1.387	0.0001279	1.158	13.888
721.71	1.387	0.0001276	1.158	13.856
723.38	1.387	0.0001273	1.158	13.824
725.06	1.387	0.0001522	1.387	13.792
726.74	1.387	0.0001667	1.522	13.760
728.44	1.388	0.0002022	1.851	13.728
729.29	1.388	0.0001971	1.807	13.712
730.14	1.388	0.0002137	1.961	13.696
730.99	1.388	0.0002120	1.948	13.680

ISO-OCTANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
731.85	1.388	0.0002625	2.414	13.664
732.71	1.388	0.0002392	2.202	13.648
733.57	1.388	0.0003444	3.175	13.632
734.43	1.388	0.0003999	3.690	13.616
735.29	1.388	0.0003415	3.155	13.600
737.03	1.388	0.0004911	4.549	13.568
737.90	1.388	0.0007577	7.026	13.552
738.77	1.388	0.0008254	7.662	13.536
739.65	1.388	0.0010401	9.668	13.520
740.52	1.388	0.0014086	13.108	13.504
741.40	1.388	0.0014531	13.538	13.488
742.28	1.388	0.0019200	17.909	13.472
744.05	1.387	0.0018392	17.196	13.440
744.93	1.387	0.0016866	15.788	13.424
745.82	1.386	0.0013022	12.204	13.408
746.71	1.386	0.0011510	10.800	13.392
747.61	1.386	0.0008796	8.263	13.376
748.50	1.386	0.0007491	7.046	13.360
749.40	1.386	0.0005314	5.005	13.344
750.30	1.387	0.0004614	4.351	13.328
751.20	1.387	0.0003578	3.378	13.312
752.11	1.387	0.0003236	3.059	13.296
753.01	1.387	0.0002601	2.461	13.280
753.92	1.387	0.0002239	2.121	13.264
754.83	1.387	0.0001748	1.658	13.248
756.66	1.387	0.0001544	1.468	13.216
757.58	1.387	0.0001315	1.252	13.200
758.50	1.387	0.0001123	1.071	13.184
764.06	1.387	0.0001159	1.113	13.088
765.93	1.387	0.0001105	1.063	13.056
768.76	1.387	0.0001187	1.147	13.008
770.65	1.388	0.0001249	1.209	12.976
771.60	1.388	0.0001297	1.258	12.960
774.47	1.388	0.0001396	1.359	12.912
776.40	1.388	0.0001306	1.274	12.880
785.18	1.388	0.0001361	1.343	12.736
787.15	1.388	0.0001964	1.943	12.704
789.14	1.388	0.0002047	2.030	12.672
791.14	1.388	0.0002125	2.113	12.640
793.15	1.388	0.0002592	2.583	12.608
796.18	1.388	0.0002639	2.640	12.560
798.21	1.389	0.0002849	2.857	12.528
800.26	1.389	0.0003816	3.838	12.496
802.31	1.389	0.0004880	4.920	12.464
803.34	1.389	0.0004832	4.878	12.448
804.38	1.389	0.0005810	5.872	12.432
805.41	1.389	0.0007085	7.170	12.416
806.45	1.389	0.0007056	7.151	12.400
807.49	1.389	0.0008751	8.880	12.384
808.54	1.389	0.0009766	9.923	12.368
809.59	1.389	0.0011499	11.699	12.352
810.64	1.389	0.0012767	13.005	12.336
811.69	1.390	0.0013891	14.169	12.320
812.74	1.389	0.0016648	17.003	12.304
813.80	1.389	0.0017010	17.396	12.288
814.86	1.389	0.0019496	19.964	12.272

ISO-OCTANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
815.93	1.389	0.0021383	21.925	12.256
816.99	1.389	0.0021314	21.882	12.240
818.06	1.389	0.0025488	26.202	12.224
819.14	1.389	0.0027545	28.354	12.208
820.21	1.389	0.0025903	26.698	12.192
821.29	1.389	0.0029732	30.685	12.176
824.54	1.388	0.0029570	30.639	12.128
825.63	1.388	0.0032662	33.887	12.112
826.72	1.388	0.0032571	33.838	12.096
827.81	1.387	0.0028265	29.403	12.080
828.91	1.387	0.0026717	27.830	12.064
830.01	1.387	0.0025442	26.536	12.048
831.12	1.387	0.0022123	23.106	12.032
832.22	1.387	0.0021507	22.492	12.016
833.33	1.387	0.0017957	18.804	12.000
834.45	1.387	0.0017432	18.280	11.984
835.56	1.387	0.0014864	15.608	11.968
836.68	1.387	0.0014156	14.883	11.952
837.80	1.387	0.0012879	13.559	11.936
838.93	1.387	0.0012234	12.898	11.920
841.18	1.387	0.0010869	11.489	11.888
842.32	1.388	0.0010656	11.279	11.872
843.45	1.388	0.0010241	10.854	11.856
844.59	1.388	0.0010568	11.217	11.840
845.74	1.388	0.0010764	11.440	11.824
846.88	1.388	0.0011125	11.839	11.808
848.03	1.388	0.0011373	12.119	11.792
849.18	1.388	0.0012213	13.033	11.776
850.34	1.388	0.0012813	13.691	11.760
851.50	1.388	0.0014553	15.572	11.744
852.66	1.388	0.0014772	15.828	11.728
853.83	1.388	0.0017150	18.401	11.712
854.99	1.388	0.0017981	19.319	11.696
856.16	1.388	0.0019760	21.259	11.680
857.34	1.388	0.0021096	22.728	11.664
858.52	1.388	0.0021954	23.686	11.648
859.70	1.388	0.0023778	25.688	11.632
860.88	1.388	0.0022636	24.488	11.616
863.26	1.388	0.0021038	22.822	11.584
864.45	1.387	0.0020803	22.598	11.568
865.65	1.387	0.0018034	19.617	11.552
866.85	1.387	0.0017206	18.742	11.536
868.06	1.387	0.0015131	16.505	11.520
869.26	1.387	0.0013915	15.200	11.504
870.47	1.387	0.0013290	14.538	11.488
871.69	1.387	0.0011776	12.899	11.472
872.91	1.388	0.0011193	12.278	11.456
874.13	1.388	0.0010591	11.634	11.440
875.35	1.388	0.0009696	10.665	11.424
876.58	1.388	0.0009695	10.679	11.408
877.81	1.388	0.0008822	9.732	11.392
879.04	1.388	0.0008681	9.589	11.376
880.28	1.388	0.0008611	9.525	11.360
881.52	1.388	0.0008318	9.214	11.344
882.77	1.388	0.0008063	8.944	11.328
884.02	1.388	0.0008875	9.860	11.312

ISO-OCTANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
885.27	1.389	0.0008315	9.251	11.296
886.52	1.389	0.0009116	10.156	11.280
887.78	1.389	0.0009344	10.425	11.264
889.05	1.389	0.0009803	10.952	11.248
890.31	1.389	0.0010650	11.915	11.232
891.58	1.389	0.0010948	12.266	11.216
892.86	1.389	0.0012336	13.842	11.200
894.13	1.389	0.0013133	14.756	11.184
895.42	1.389	0.0013807	15.535	11.168
896.70	1.390	0.0015415	17.370	11.152
897.99	1.390	0.0016334	18.432	11.136
899.28	1.390	0.0017691	19.992	11.120
900.58	1.390	0.0017869	20.223	11.104
901.88	1.390	0.0019001	21.535	11.088
903.18	1.390	0.0019704	22.363	11.072
904.49	1.390	0.0019815	22.523	11.056
905.80	1.390	0.0021718	24.720	11.040
907.11	1.390	0.0022885	26.086	11.024
908.43	1.391	0.0024030	27.432	11.008
909.75	1.391	0.0028094	32.118	10.992
911.08	1.391	0.0030079	34.437	10.976
912.41	1.391	0.0034843	39.950	10.960
913.74	1.391	0.0039736	45.627	10.944
915.08	1.391	0.0042026	48.327	10.928
916.42	1.391	0.0059128	68.092	10.912
919.12	1.389	0.0059439	68.652	10.880
920.47	1.390	0.0057874	66.943	10.864
921.83	1.389	0.0072862	84.403	10.848
923.19	1.387	0.0078318	90.858	10.832
924.56	1.386	0.0061011	70.884	10.816
925.93	1.386	0.0056018	65.180	10.800
927.30	1.386	0.0058269	67.900	10.784
928.68	1.385	0.0050134	58.508	10.768
930.06	1.385	0.0036854	43.073	10.752
931.45	1.385	0.0035195	41.195	10.736
932.84	1.385	0.0030780	36.081	10.720
934.23	1.386	0.0027508	32.294	10.704
935.63	1.386	0.0026245	30.858	10.688
937.03	1.386	0.0023692	27.898	10.672
938.44	1.386	0.0022251	26.240	10.656
939.85	1.387	0.0021582	25.490	10.640
941.27	1.387	0.0020773	24.571	10.624
942.68	1.387	0.0019867	23.534	10.608
944.11	1.387	0.0020379	24.178	10.592
945.54	1.387	0.0019676	23.379	10.576
946.97	1.387	0.0019819	23.584	10.560
948.41	1.387	0.0020345	24.247	10.544
951.29	1.388	0.0020553	24.569	10.512
952.74	1.388	0.0020874	24.991	10.496
954.20	1.388	0.0020676	24.792	10.480
955.66	1.388	0.0021211	25.473	10.464
958.59	1.388	0.0021542	25.949	10.432
960.06	1.389	0.0021792	26.290	10.416
961.54	1.389	0.0023559	28.467	10.400
963.02	1.390	0.0025054	30.320	10.384
964.51	1.390	0.0031713	38.437	10.368

ISO-OCTANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
966.00	1.391	0.0029692	36.044	10.352
967.49	1.392	0.0049645	60.357	10.336
968.99	1.389	0.0091969	111.988	10.320
970.50	1.386	0.0056818	69.294	10.304
973.52	1.387	0.0050955	62.336	10.272
978.09	1.386	0.0049505	60.847	10.224
981.16	1.386	0.0048525	59.829	10.192
982.70	1.386	0.0043654	53.908	10.176
985.80	1.385	0.0042329	52.437	10.144
988.92	1.385	0.0041771	51.909	10.112
990.49	1.385	0.0040379	50.259	10.096
992.06	1.384	0.0035305	44.014	10.080
993.64	1.384	0.0030514	38.101	10.064
995.22	1.384	0.0025668	32.101	10.048
996.81	1.384	0.0019342	24.229	10.032
1000.00	1.385	0.0013128	16.497	10.000
1001.60	1.385	0.0011642	14.654	9.984
1003.21	1.386	0.0011754	14.818	9.968
1004.82	1.386	0.0012055	15.222	9.952
1008.07	1.386	0.0013348	16.909	9.920
1009.69	1.386	0.0013140	16.673	9.904
1011.33	1.386	0.0014579	18.528	9.888
1012.97	1.386	0.0015598	19.855	9.872
1014.61	1.386	0.0015182	19.357	9.856
1016.26	1.386	0.0016184	20.668	9.840
1017.92	1.386	0.0014537	18.595	9.824
1019.58	1.386	0.0012638	16.192	9.808
1021.24	1.386	0.0012112	15.544	9.792
1022.91	1.386	0.0009901	12.727	9.776
1024.59	1.386	0.0010046	12.935	9.760
1026.27	1.386	0.0008355	10.775	9.744
1027.96	1.386	0.0008344	10.779	9.728
1029.65	1.387	0.0007477	9.675	9.712
1031.35	1.387	0.0007439	9.641	9.696
1033.06	1.387	0.0007216	9.368	9.680
1034.77	1.387	0.0006897	8.968	9.664
1036.48	1.387	0.0007190	9.365	9.648
1038.21	1.387	0.0006220	8.115	9.632
1039.93	1.387	0.0006608	8.636	9.616
1041.67	1.387	0.0005819	7.617	9.600
1043.41	1.387	0.0005779	7.577	9.584
1045.15	1.387	0.0005440	7.145	9.568
1046.90	1.387	0.0005693	7.489	9.552
1048.66	1.388	0.0004776	6.294	9.536
1052.19	1.388	0.0004908	6.489	9.504
1055.74	1.388	0.0005047	6.696	9.472
1059.32	1.388	0.0005134	6.834	9.440
1061.12	1.388	0.0005307	7.077	9.424
1062.93	1.388	0.0005368	7.170	9.408
1066.55	1.388	0.0005454	7.310	9.376
1070.21	1.389	0.0005857	7.876	9.344
1072.04	1.389	0.0006258	8.430	9.328
1073.88	1.389	0.0006390	8.623	9.312
1075.73	1.389	0.0007679	10.381	9.296
1077.59	1.389	0.0007506	10.164	9.280
1079.45	1.389	0.0008584	11.644	9.264

ISO-OCTANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
1081.32	1.389	0.0009187	12.483	9.248
1083.19	1.389	0.0010014	13.631	9.232
1085.07	1.390	0.0006734	9.182	9.216
1086.96	1.390	0.0011782	16.094	9.200
1088.85	1.390	0.0015517	21.231	9.184
1090.75	1.390	0.0018391	25.209	9.168
1092.66	1.390	0.0021383	29.360	9.152
1094.57	1.389	0.0020124	27.680	9.136
1098.42	1.389	0.0019212	26.518	9.104
1102.29	1.389	0.0018353	25.422	9.072
1104.24	1.389	0.0016596	23.028	9.056
1106.20	1.389	0.0015823	21.995	9.040
1108.16	1.389	0.0015428	21.485	9.024
1110.12	1.389	0.0015039	20.979	9.008
1112.10	1.389	0.0014924	20.857	8.992
1114.08	1.389	0.0014196	19.875	8.976
1116.07	1.390	0.0013825	19.390	8.960
1118.07	1.390	0.0013118	18.432	8.944
1120.07	1.390	0.0012592	17.723	8.928
1122.08	1.390	0.0012072	17.023	8.912
1124.10	1.390	0.0011887	16.791	8.896
1126.13	1.390	0.0011378	16.102	8.880
1128.16	1.390	0.0011197	15.874	8.864
1130.20	1.391	0.0011177	15.874	8.848
1132.25	1.391	0.0011317	16.102	8.832
1134.30	1.391	0.0011296	16.102	8.816
1136.36	1.391	0.0011597	16.560	8.800
1138.43	1.392	0.0011899	17.023	8.784
1140.51	1.392	0.0012530	17.958	8.768
1142.60	1.392	0.0013169	18.909	8.752
1144.69	1.392	0.0014328	20.610	8.736
1146.79	1.393	0.0015517	22.361	8.720
1148.90	1.393	0.0017103	24.692	8.704
1151.01	1.394	0.0020705	29.948	8.688
1153.14	1.395	0.0028644	41.507	8.672
1155.27	1.395	0.0038947	56.541	8.656
1157.41	1.395	0.0050028	72.763	8.640
1159.56	1.396	0.0062372	90.886	8.624
1161.71	1.395	0.0087332	127.492	8.608
1163.87	1.393	0.0099976	146.222	8.592
1166.05	1.389	0.0106307	155.771	8.576
1168.22	1.387	0.0075152	110.326	8.560
1170.41	1.387	0.0051742	76.101	8.544
1172.61	1.388	0.0030829	45.428	8.528
1174.81	1.389	0.0024431	36.067	8.512
1177.02	1.391	0.0020914	30.933	8.496
1179.25	1.392	0.0022727	33.678	8.480
1181.47	1.393	0.0027237	40.439	8.464
1183.71	1.394	0.0032518	48.370	8.448
1185.96	1.394	0.0042108	62.754	8.432
1188.21	1.395	0.0051260	76.539	8.416
1190.48	1.396	0.0064376	96.306	8.400
1192.75	1.396	0.0083357	124.940	8.384
1195.03	1.395	0.0097492	146.406	8.368
1197.32	1.394	0.0124237	186.926	8.352
1199.62	1.392	0.0137352	207.057	8.336

ISO-OCTANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
1201.92	1.389	0.0141383	213.542	8.320
1204.24	1.385	0.0128873	195.023	8.304
1206.56	1.383	0.0096383	146.137	8.288
1208.90	1.383	0.0073015	110.920	8.272
1211.24	1.384	0.0050504	76.872	8.256
1213.59	1.385	0.0038137	58.161	8.240
1215.95	1.387	0.0033830	51.692	8.224
1218.32	1.388	0.0033087	50.656	8.208
1220.70	1.388	0.0033485	51.365	8.192
1223.09	1.389	0.0035758	54.960	8.176
1225.49	1.389	0.0035514	54.691	8.160
1227.90	1.390	0.0035957	55.483	8.144
1232.74	1.391	0.0038241	59.239	8.112
1235.18	1.392	0.0047362	73.514	8.096
1237.62	1.393	0.0061209	95.194	8.080
1240.08	1.393	0.0093023	144.960	8.064
1242.55	1.391	0.0116690	182.204	8.048
1245.02	1.387	0.0116115	181.666	8.032
1247.51	1.385	0.0080832	126.718	8.016
1250.00	1.385	0.0062615	98.355	8.000
1252.51	1.385	0.0048361	76.119	7.984
1255.02	1.386	0.0039754	62.697	7.968
1257.55	1.386	0.0034809	55.007	7.952
1260.08	1.387	0.0027844	44.090	7.936
1262.63	1.388	0.0024584	39.006	7.920
1265.18	1.388	0.0021702	34.504	7.904
1267.75	1.389	0.0019817	31.570	7.888
1270.33	1.390	0.0023084	36.851	7.872
1272.91	1.391	0.0028792	46.055	7.856
1275.51	1.391	0.0035029	56.146	7.840
1278.12	1.391	0.0044257	71.083	7.824
1280.74	1.391	0.0044449	71.537	7.808
1283.37	1.390	0.0042850	69.106	7.792
1286.01	1.390	0.0041367	66.851	7.776
1288.66	1.390	0.0037029	59.964	7.760
1291.32	1.390	0.0034167	55.444	7.744
1294.00	1.390	0.0032569	52.961	7.728
1296.68	1.390	0.0026384	42.992	7.712
1299.38	1.391	0.0021757	35.525	7.696
1302.08	1.391	0.0016373	26.790	7.680
1304.80	1.392	0.0010951	17.956	7.664
1307.53	1.394	0.0009533	15.663	7.648
1310.27	1.395	0.0010999	18.111	7.632
1313.03	1.396	0.0017010	28.067	7.616
1315.79	1.396	0.0022691	37.520	7.600
1318.57	1.397	0.0025988	43.061	7.584
1321.35	1.398	0.0031902	52.971	7.568
1324.15	1.398	0.0035170	58.522	7.552
1326.96	1.399	0.0037566	62.642	7.536
1329.79	1.400	0.0039765	66.449	7.520
1335.47	1.402	0.0042966	72.106	7.488
1338.33	1.405	0.0047363	79.655	7.472
1341.20	1.407	0.0062688	105.654	7.456
1344.09	1.410	0.0092282	155.867	7.440
1346.98	1.412	0.0127984	216.634	7.424
1349.89	1.412	0.0176247	298.972	7.408

ISO-OCTANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
1352.81	1.414	0.0200875	341.486	7.392
1355.75	1.417	0.0291954	497.397	7.376
1358.70	1.410	0.0432428	738.324	7.360
1361.66	1.393	0.0493832	845.001	7.344
1364.63	1.378	0.0397341	681.379	7.328
1367.62	1.375	0.0260303	447.358	7.312
1370.61	1.379	0.0184399	317.602	7.296
1373.63	1.384	0.0165346	285.413	7.280
1376.65	1.387	0.0172729	298.813	7.264
1379.69	1.388	0.0188976	327.640	7.248
1382.74	1.387	0.0220275	382.750	7.232
1385.81	1.384	0.0229446	399.571	7.216
1388.89	1.381	0.0217873	380.260	7.200
1391.98	1.379	0.0177505	310.495	7.184
1395.09	1.379	0.0139717	244.941	7.168
1398.21	1.382	0.0114428	201.054	7.152
1401.35	1.384	0.0114019	200.786	7.136
1404.49	1.385	0.0107545	189.811	7.120
1407.66	1.387	0.0109954	194.500	7.104
1410.84	1.388	0.0111827	198.259	7.088
1414.03	1.389	0.0110262	195.926	7.072
1417.23	1.390	0.0121952	217.190	7.056
1420.46	1.392	0.0123252	220.005	7.040
1423.69	1.393	0.0142910	255.675	7.024
1426.94	1.393	0.0145940	261.691	7.008
1430.21	1.394	0.0160397	288.274	6.992
1433.49	1.395	0.0171433	308.815	6.976
1436.78	1.396	0.0186207	336.200	6.960
1440.09	1.398	0.0209096	378.394	6.944
1443.42	1.399	0.0238135	431.942	6.928
1446.76	1.399	0.0266572	484.643	6.912
1450.12	1.400	0.0309868	564.665	6.896
1453.49	1.400	0.0361718	660.682	6.880
1456.88	1.400	0.0429580	786.462	6.864
1460.28	1.395	0.0545087	1000.257	6.848
1463.70	1.382	0.0611223	1124.246	6.832
1467.14	1.367	0.0609647	1123.983	6.816
1470.59	1.354	0.0533017	985.014	6.800
1474.06	1.347	0.0421735	781.204	6.784
1477.54	1.344	0.0335260	622.488	6.768
1481.04	1.343	0.0252988	470.843	6.752
1484.56	1.344	0.0168350	314.066	6.736
1488.10	1.346	0.0110647	206.910	6.720
1491.65	1.351	0.0047741	89.489	6.704
1495.22	1.356	0.0041391	77.771	6.688
1498.80	1.359	0.0035484	66.832	6.672
1502.40	1.361	0.0035110	66.286	6.656
1506.02	1.362	0.0032314	61.155	6.640
1509.66	1.363	0.0029121	55.246	6.624
1513.32	1.364	0.0022076	41.981	6.608
1516.99	1.366	0.0015070	28.728	6.592
1520.68	1.367	0.0012691	24.252	6.576
1524.39	1.368	0.0010701	20.499	6.560
1528.12	1.369	0.0010868	20.870	6.544
1531.86	1.370	0.0010568	20.343	6.528
1535.63	1.370	0.0010269	19.816	6.512

ISO-OCTANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
1539.41	1.371	0.0009971	19.289	6.496
1543.21	1.371	0.0009675	18.762	6.480
1547.03	1.372	0.0009380	18.235	6.464
1550.87	1.372	0.0009086	17.707	6.448
1554.73	1.373	0.0008794	17.180	6.432
1558.60	1.373	0.0008503	16.653	6.416
1562.50	1.373	0.0008213	16.126	6.400
1566.42	1.374	0.0007925	15.599	6.384
1570.35	1.374	0.0007638	15.072	6.368
1574.31	1.374	0.0007352	14.545	6.352
1578.28	1.375	0.0007068	14.017	6.336
1582.28	1.375	0.0006785	13.490	6.320
1586.29	1.375	0.0006503	12.963	6.304
1590.33	1.375	0.0006176	12.342	6.288
1598.47	1.376	0.0005967	11.986	6.256
1606.68	1.376	0.0005746	11.600	6.224
1614.99	1.377	0.0005597	11.359	6.192
1623.38	1.377	0.0005680	11.587	6.160
1627.60	1.377	0.0005862	11.990	6.144
1631.85	1.378	0.0006235	12.786	6.128
1636.13	1.378	0.0006328	13.010	6.112
1640.42	1.378	0.0006865	14.151	6.096
1644.74	1.378	0.0006971	14.408	6.080
1649.08	1.378	0.0007290	15.108	6.064
1653.44	1.378	0.0007891	16.396	6.048
1657.83	1.378	0.0007877	16.410	6.032
1666.67	1.379	0.0008144	17.057	6.000
1675.60	1.379	0.0008185	17.233	5.968
1680.11	1.379	0.0008289	17.500	5.952
1689.19	1.379	0.0008248	17.508	5.920
1693.77	1.379	0.0008249	17.558	5.904
1703.00	1.379	0.0008363	17.897	5.872
1707.65	1.379	0.0008008	17.183	5.856
1712.33	1.379	0.0007675	16.515	5.840
1721.76	1.379	0.0007047	15.246	5.808
1726.52	1.379	0.0006404	13.894	5.792
1731.30	1.379	0.0006172	13.428	5.776
1736.11	1.379	0.0005471	11.936	5.760
1740.95	1.380	0.0005115	11.191	5.744
1745.81	1.380	0.0004691	10.291	5.728
1750.70	1.380	0.0004435	9.758	5.712
1755.62	1.380	0.0003911	8.629	5.696
1760.56	1.380	0.0003794	8.394	5.680
1770.54	1.380	0.0003258	7.250	5.648
1775.57	1.380	0.0003105	6.928	5.632
1780.63	1.380	0.0003210	7.184	5.616
1785.71	1.380	0.0003301	7.407	5.600
1790.83	1.380	0.0003494	7.863	5.584
1795.98	1.381	0.0003600	8.124	5.568
1801.15	1.381	0.0003327	7.530	5.552
1806.36	1.381	0.0003156	7.163	5.536
1811.59	1.381	0.0002920	6.647	5.520
1816.86	1.381	0.0002787	6.362	5.504
1822.16	1.381	0.0002917	6.679	5.488
1827.49	1.381	0.0002974	6.831	5.472
1832.85	1.381	0.0003437	7.915	5.456

ISO-OCTANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
1838.24	1.381	0.0003422	7.905	5.440
1843.66	1.381	0.0003465	8.028	5.424
1849.11	1.381	0.0003366	7.821	5.408
1851.85	1.381	0.0003236	7.530	5.400
1854.60	1.381	0.0003193	7.441	5.392
1857.36	1.381	0.0002997	6.994	5.384
1860.12	1.381	0.0002985	6.977	5.376
1862.89	1.381	0.0002841	6.651	5.368
1865.67	1.381	0.0002875	6.740	5.360
1868.46	1.381	0.0002829	6.642	5.352
1871.26	1.381	0.0002872	6.752	5.344
1874.06	1.381	0.0002815	6.629	5.336
1876.88	1.381	0.0002790	6.580	5.328
1879.70	1.381	0.0002745	6.484	5.320
1882.53	1.382	0.0002730	6.459	5.312
1885.37	1.382	0.0002665	6.315	5.304
1888.22	1.382	0.0002608	6.188	5.296
1891.07	1.382	0.0002492	5.921	5.288
1893.94	1.382	0.0002411	5.738	5.280
1896.81	1.382	0.0002290	5.458	5.272
1899.70	1.382	0.0002216	5.290	5.264
1902.59	1.382	0.0002046	4.891	5.256
1905.49	1.382	0.0001949	4.668	5.248
1908.40	1.382	0.0001856	4.451	5.240
1911.32	1.382	0.0001792	4.304	5.232
1914.24	1.382	0.0001674	4.027	5.224
1917.18	1.382	0.0001671	4.025	5.216
1920.12	1.382	0.0001622	3.913	5.208
1923.08	1.382	0.0001710	4.131	5.200
1926.04	1.382	0.0001722	4.168	5.192
1929.01	1.382	0.0001863	4.515	5.184
1931.99	1.382	0.0001985	4.819	5.176
1934.99	1.382	0.0002142	5.209	5.168
1937.98	1.382	0.0002305	5.614	5.160
1940.99	1.382	0.0002422	5.907	5.152
1944.01	1.382	0.0002473	6.041	5.144
1947.04	1.382	0.0002462	6.023	5.136
1950.08	1.382	0.0002408	5.902	5.128
1953.13	1.382	0.0002257	5.538	5.120
1956.18	1.382	0.0002106	5.177	5.112
1959.25	1.382	0.0001927	4.745	5.104
1962.32	1.382	0.0001755	4.327	5.096
1965.41	1.382	0.0001683	4.157	5.088
1968.50	1.382	0.0001647	4.074	5.080
1971.61	1.382	0.0001736	4.300	5.072
1974.72	1.382	0.0001830	4.540	5.064
1977.85	1.383	0.0001943	4.829	5.056
1980.98	1.383	0.0002068	5.149	5.048
1984.13	1.383	0.0002081	5.188	5.040
1987.28	1.383	0.0002096	5.234	5.032
1990.45	1.383	0.0001990	4.977	5.024
1993.62	1.383	0.0001849	4.633	5.016
1996.81	1.383	0.0001681	4.218	5.008
2000.00	1.383	0.0001676	4.212	5.000
2003.21	1.383	0.0001623	4.086	4.992
2006.42	1.383	0.0001688	4.257	4.984

ISO-OCTANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
2009.65	1.383	0.0001831	4.625	4.976
2012.88	1.383	0.0001967	4.975	4.968
2016.13	1.383	0.0002184	5.533	4.960
2019.39	1.383	0.0002293	5.818	4.952
2022.65	1.383	0.0002353	5.981	4.944
2025.93	1.383	0.0002350	5.983	4.936
2029.22	1.383	0.0002183	5.566	4.928
2032.52	1.383	0.0001991	5.085	4.920
2035.83	1.383	0.0001768	4.523	4.912
2039.15	1.383	0.0001553	3.978	4.904
2042.48	1.383	0.0001374	3.526	4.896
2045.83	1.383	0.0001243	3.195	4.888
2049.18	1.383	0.0001143	2.943	4.880
2052.55	1.383	0.0001064	2.744	4.872
2055.92	1.383	0.0001057	2.731	4.864
2059.31	1.383	0.0001057	2.737	4.856
2062.71	1.383	0.0001055	2.734	4.848
2066.12	1.383	0.0001077	2.796	4.840
2069.54	1.383	0.0001161	3.019	4.832
2072.97	1.383	0.0001241	3.234	4.824
2076.41	1.383	0.0001410	3.680	4.816
2079.87	1.384	0.0001545	4.038	4.808
2083.33	1.384	0.0001805	4.726	4.800
2086.81	1.384	0.0002146	5.628	4.792
2090.30	1.384	0.0002435	6.397	4.784
2093.80	1.384	0.0002741	7.212	4.776
2097.32	1.384	0.0002966	7.818	4.768
2100.84	1.384	0.0003105	8.197	4.760
2104.38	1.384	0.0003115	8.238	4.752
2107.93	1.384	0.0002994	7.932	4.744
2111.49	1.384	0.0002835	7.522	4.736
2115.06	1.384	0.0002616	6.954	4.728
2118.64	1.384	0.0002401	6.393	4.720
2122.24	1.384	0.0002259	6.025	4.712
2125.85	1.384	0.0002103	5.618	4.704
2129.47	1.384	0.0002008	5.375	4.696
2133.11	1.384	0.0001949	5.226	4.688
2136.75	1.384	0.0001863	5.001	4.680
2140.41	1.384	0.0001849	4.974	4.672
2144.08	1.384	0.0001834	4.941	4.664
2147.77	1.384	0.0001874	5.059	4.656
2151.46	1.384	0.0001968	5.321	4.648
2155.17	1.384	0.0002007	5.435	4.640
2158.90	1.384	0.0002128	5.774	4.632
2162.63	1.384	0.0002217	6.024	4.624
2166.38	1.384	0.0002334	6.353	4.616
2170.14	1.384	0.0002455	6.694	4.608
2173.91	1.384	0.0002608	7.125	4.600
2177.70	1.384	0.0002759	7.549	4.592
2181.50	1.384	0.0002952	8.092	4.584
2185.32	1.384	0.0003076	8.447	4.576
2189.14	1.384	0.0003250	8.942	4.568
2192.98	1.384	0.0003334	9.188	4.560
2196.84	1.384	0.0003380	9.331	4.552
2200.70	1.384	0.0003329	9.206	4.544
2204.59	1.385	0.0003207	8.884	4.536

ISO-OCTANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
2208.48	1.385	0.0003016	8.371	4.528
2212.39	1.385	0.0002823	7.848	4.520
2216.31	1.385	0.0002619	7.294	4.512
2220.25	1.385	0.0002426	6.769	4.504
2224.20	1.385	0.0002315	6.471	4.496
2228.16	1.385	0.0002200	6.159	4.488
2232.14	1.385	0.0002249	6.310	4.480
2236.14	1.385	0.0002306	6.479	4.472
2240.14	1.385	0.0002475	6.967	4.464
2244.17	1.385	0.0002694	7.596	4.456
2248.20	1.385	0.0002890	8.164	4.448
2252.25	1.385	0.0003212	9.090	4.440
2256.32	1.385	0.0003486	9.883	4.432
2260.40	1.385	0.0003814	10.834	4.424
2264.49	1.385	0.0004119	11.721	4.416
2268.60	1.385	0.0004482	12.778	4.408
2272.73	1.385	0.0004808	13.732	4.400
2276.87	1.385	0.0005080	14.534	4.392
2281.02	1.385	0.0005153	14.769	4.384
2285.19	1.385	0.0005111	14.678	4.376
2289.38	1.385	0.0004843	13.932	4.368
2293.58	1.385	0.0004540	13.086	4.360
2297.79	1.385	0.0004159	12.009	4.352
2302.03	1.385	0.0003785	10.951	4.344
2306.27	1.385	0.0003455	10.013	4.336
2310.54	1.386	0.0003212	9.327	4.328
2314.82	1.386	0.0003109	9.042	4.320
2319.11	1.386	0.0003003	8.751	4.312
2323.42	1.386	0.0002967	8.662	4.304
2327.75	1.386	0.0002923	8.549	4.296
2332.09	1.386	0.0002956	8.662	4.288
2336.45	1.386	0.0003056	8.971	4.280
2340.82	1.386	0.0003144	9.248	4.272
2345.22	1.386	0.0003300	9.725	4.264
2349.62	1.386	0.0003539	10.451	4.256
2354.05	1.386	0.0003950	11.686	4.248
2358.49	1.386	0.0004344	12.874	4.240
2362.95	1.386	0.0004781	14.197	4.232
2367.42	1.386	0.0005080	15.113	4.224
2371.92	1.386	0.0005334	15.898	4.216
2376.43	1.386	0.0005535	16.529	4.208
2380.95	1.387	0.0005647	16.897	4.200
2385.50	1.387	0.0005713	17.125	4.192
2390.06	1.387	0.0005715	17.165	4.184
2394.64	1.387	0.0005721	17.216	4.176
2399.23	1.387	0.0005548	16.728	4.168
2403.85	1.387	0.0005280	15.950	4.160
2408.48	1.387	0.0004889	14.796	4.152
2413.13	1.387	0.0004480	13.586	4.144
2417.80	1.387	0.0004082	12.402	4.136
2422.48	1.387	0.0003806	11.586	4.128
2427.18	1.387	0.0003611	11.014	4.120
2431.91	1.387	0.0003576	10.928	4.112
2436.65	1.387	0.0003635	11.131	4.104
2441.41	1.387	0.0003812	11.695	4.096
2446.18	1.388	0.0003993	12.273	4.088

ISO-OCTANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
2450.98	1.388	0.0004198	12.931	4.080
2455.80	1.388	0.0004328	13.357	4.072
2460.63	1.388	0.0004413	13.646	4.064
2465.48	1.388	0.0004427	13.715	4.056
2470.36	1.388	0.0004341	13.475	4.048
2475.25	1.388	0.0004246	13.206	4.040
2480.16	1.388	0.0004038	12.585	4.032
2485.09	1.388	0.0003876	12.105	4.024
2490.04	1.388	0.0003661	11.456	4.016
2495.01	1.388	0.0003471	10.881	4.008
2500.00	1.389	0.0003298	10.360	4.000
2505.01	1.389	0.0003180	10.010	3.992
2510.04	1.389	0.0003093	9.756	3.984
2515.09	1.389	0.0003133	9.901	3.976
2520.16	1.389	0.0003230	10.229	3.968
2525.25	1.389	0.0003450	10.947	3.960
2530.36	1.390	0.0003775	12.004	3.952
2535.50	1.390	0.0004359	13.888	3.944
2540.65	1.390	0.0004731	15.104	3.936
2545.83	1.390	0.0005339	17.082	3.928
2551.02	1.390	0.0006022	19.306	3.920
2556.24	1.390	0.0006833	21.951	3.912
2561.48	1.391	0.0007570	24.367	3.904
2566.74	1.391	0.0008396	27.080	3.896
2572.02	1.391	0.0009151	29.578	3.888
2577.32	1.391	0.0009606	31.112	3.880
2582.65	1.391	0.0010153	32.950	3.872
2587.99	1.391	0.0010408	33.849	3.864
2593.36	1.392	0.0010777	35.122	3.856
2598.75	1.392	0.0010970	35.824	3.848
2604.17	1.392	0.0011240	36.784	3.840
2609.60	1.392	0.0011534	37.824	3.832
2615.06	1.392	0.0011717	38.505	3.824
2620.55	1.393	0.0011956	39.373	3.816
2626.05	1.393	0.0011915	39.319	3.808
2631.58	1.393	0.0011901	39.355	3.800
2637.13	1.393	0.0011908	39.462	3.792
2642.71	1.394	0.0011802	39.193	3.784
2648.31	1.394	0.0011920	39.670	3.776
2653.93	1.394	0.0012206	40.709	3.768
2659.57	1.395	0.0012581	42.046	3.760
2665.25	1.395	0.0013488	45.175	3.752
2670.94	1.396	0.0014445	48.482	3.744
2676.66	1.396	0.0015925	53.565	3.736
2682.40	1.396	0.0017331	58.418	3.728
2688.17	1.397	0.0019060	64.384	3.720
2693.97	1.397	0.0021615	73.173	3.712
2699.78	1.398	0.0022280	75.589	3.704
2705.63	1.398	0.0026494	90.080	3.696
2711.50	1.399	0.0026201	89.277	3.688
2717.39	1.399	0.0026630	90.935	3.680
2723.31	1.400	0.0029110	99.620	3.672
2729.26	1.400	0.0024920	85.469	3.664
2735.23	1.401	0.0028534	98.078	3.656
2741.23	1.402	0.0025387	87.451	3.648
2747.25	1.403	0.0023848	82.332	3.640

ISO-OCTANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
2753.30	1.404	0.0026751	92.557	3.632
2759.38	1.406	0.0024991	86.658	3.624
2765.49	1.408	0.0026244	91.205	3.616
2771.62	1.411	0.0026669	92.887	3.608
2777.78	1.417	0.0027703	96.703	3.600
2783.96	1.419	0.0148163	518.337	3.592
2790.18	1.415	0.0152017	533.007	3.584
2796.42	1.415	0.0156539	550.090	3.576
2802.69	1.415	0.0166773	587.370	3.568
2808.99	1.416	0.0179670	634.214	3.560
2815.32	1.418	0.0198840	703.465	3.552
2821.67	1.419	0.0221011	783.666	3.544
2828.05	1.420	0.0250370	889.773	3.536
2834.47	1.422	0.0283894	1011.203	3.528
2840.91	1.423	0.0328769	1173.704	3.520
2847.38	1.423	0.0377071	1349.207	3.512
2853.88	1.422	0.0427346	1532.586	3.504
2860.41	1.420	0.0475135	1707.871	3.496
2866.97	1.418	0.0527348	1899.897	3.488
2873.56	1.414	0.0593609	2143.536	3.480
2880.18	1.407	0.0617022	2233.214	3.472
2886.84	1.402	0.0615040	2231.186	3.464
2893.52	1.398	0.0626709	2278.778	3.456
2900.23	1.396	0.0633233	2307.841	3.448
2906.98	1.393	0.0662100	2418.663	3.440
2913.75	1.389	0.0688122	2519.577	3.432
2920.56	1.384	0.0721545	2648.132	3.424
2927.40	1.379	0.0752494	2768.184	3.416
2934.27	1.369	0.0817937	3015.988	3.408
2941.18	1.352	0.0819100	3027.391	3.400
2948.11	1.336	0.0694509	2572.950	3.392
2955.08	1.330	0.0555481	2062.758	3.384
2962.09	1.329	0.0443424	1650.544	3.376
2969.12	1.330	0.0360273	1344.217	3.368
2976.19	1.331	0.0296522	1108.991	3.360
2983.29	1.333	0.0241032	903.608	3.352
2990.43	1.335	0.0196603	738.812	3.344
2997.60	1.337	0.0166214	626.110	3.336
3004.81	1.334	0.0146084	551.605	3.328
3012.05	1.337	0.0019949	75.509	3.320
3019.32	1.345	0.0016025	60.802	3.312
3026.63	1.348	0.0013042	49.603	3.304
3033.98	1.351	0.0010558	40.255	3.296
3041.36	1.354	0.0008828	33.739	3.288
3048.78	1.355	0.0007547	28.912	3.280
3056.24	1.357	0.0006631	25.467	3.272
3063.73	1.359	0.0005859	22.559	3.264
3071.25	1.360	0.0005476	21.134	3.256
3078.82	1.361	0.0005195	20.099	3.248
3086.42	1.362	0.0004980	19.314	3.240
3094.06	1.363	0.0004977	19.352	3.232
3101.74	1.364	0.0005144	20.051	3.224
3109.45	1.365	0.0005561	21.729	3.216
3117.21	1.365	0.0005862	22.963	3.208
3125.00	1.366	0.0006324	24.833	3.200
3132.83	1.366	0.0006972	27.446	3.192

ISO-OCTANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
3140.70	1.367	0.0007716	30.454	3.184
3148.62	1.367	0.0008255	32.663	3.176
3156.57	1.368	0.0008558	33.945	3.168
3164.56	1.368	0.0008988	35.743	3.160
3172.59	1.369	0.0009217	36.747	3.152
3180.66	1.369	0.0009094	36.347	3.144
3188.78	1.369	0.0008797	35.252	3.136
3196.93	1.369	0.0008301	33.349	3.128
3205.13	1.370	0.0007785	31.356	3.120
3213.37	1.370	0.0006926	27.966	3.112
3221.65	1.370	0.0005929	24.004	3.104
3229.97	1.371	0.0008662	35.159	3.096
3238.34	1.371	0.0007692	31.300	3.088
3246.75	1.371	0.0006907	28.181	3.080
3255.21	1.371	0.0006331	25.899	3.072
3263.71	1.371	0.0005872	24.082	3.064
3272.25	1.372	0.0005564	22.878	3.056
3280.84	1.372	0.0005345	22.037	3.048
3289.47	1.372	0.0005170	21.369	3.040
3298.15	1.372	0.0005059	20.967	3.032
3306.88	1.372	0.0004974	20.668	3.024
3315.65	1.373	0.0004879	20.329	3.016
3324.47	1.373	0.0004826	20.162	3.008
3333.33	1.373	0.0004758	19.931	3.000
3342.25	1.373	0.0004653	19.543	2.992
3351.21	1.373	0.0004500	18.953	2.984
3360.22	1.373	0.0004290	18.115	2.976
3369.27	1.373	0.0004009	16.975	2.968
3378.38	1.374	0.0003660	15.540	2.960
3387.53	1.374	0.0003297	14.035	2.952
3396.74	1.374	0.0002885	12.314	2.944
3406.00	1.374	0.0002533	10.840	2.936
3415.30	1.374	0.0002212	9.493	2.928
3424.66	1.374	0.0001936	8.331	2.920
3434.07	1.374	0.0001734	7.484	2.912
3443.53	1.375	0.0001548	6.699	2.904
3453.04	1.375	0.0001390	6.030	2.896
3462.60	1.375	0.0001202	5.231	2.888
3472.22	1.375	0.0001049	4.575	2.880
3481.89	1.375	0.0000888	3.884	2.872
3491.62	1.375	0.0000748	3.282	2.864
3501.40	1.375	0.0000638	2.805	2.856
3511.24	1.375	0.0000554	2.447	2.848
3521.13	1.375	0.0000470	2.080	2.840
3531.07	1.376	0.0000437	1.938	2.832
3541.08	1.376	0.0000414	1.842	2.824
3551.14	1.376	0.0000411	1.835	2.816
3561.25	1.376	0.0000394	1.763	2.808
3571.43	1.376	0.0000417	1.873	2.800
3581.66	1.376	0.0000437	1.965	2.792
3591.95	1.376	0.0000470	2.124	2.784
3602.31	1.376	0.0000522	2.364	2.776
3612.72	1.376	0.0000593	2.692	2.768
3623.19	1.376	0.0000658	2.998	2.760
3633.72	1.377	0.0000751	3.430	2.752
3644.32	1.377	0.0000867	3.968	2.744

ISO-OCTANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
3654.97	1.377	0.0000987	4.532	2.736
3665.69	1.377	0.0001107	5.097	2.728
3676.47	1.377	0.0001236	5.708	2.720
3687.32	1.377	0.0001390	6.443	2.712
3698.23	1.377	0.0001513	7.030	2.704
3709.20	1.377	0.0001691	7.883	2.696
3720.24	1.377	0.0001888	8.828	2.688
3731.34	1.377	0.0002112	9.904	2.680
3742.52	1.377	0.0002355	11.076	2.672
3753.75	1.377	0.0002800	13.208	2.664
3765.06	1.377	0.0002880	13.624	2.656
3776.44	1.377	0.0003091	14.670	2.648
3787.88	1.377	0.0003286	15.644	2.640
3799.39	1.378	0.0003418	16.317	2.632
3810.98	1.378	0.0003543	16.969	2.624
3822.63	1.378	0.0003623	17.403	2.616
3834.36	1.378	0.0003655	17.610	2.608
3846.15	1.378	0.0003710	17.932	2.600
3858.03	1.378	0.0003756	18.208	2.592
3869.97	1.378	0.0004050	19.698	2.584
3881.99	1.378	0.0003392	16.549	2.576
3894.08	1.378	0.0003768	18.440	2.568
3906.25	1.378	0.0003675	18.040	2.560
3891.40	1.378	0.0003028	14.807	2.570
3900.23	1.378	0.0002924	14.333	2.564
3909.09	1.378	0.0002734	13.432	2.558
3918.00	1.378	0.0002598	12.793	2.552
3926.94	1.378	0.0002510	12.386	2.547
3935.93	1.378	0.0002444	12.090	2.541
3944.95	1.378	0.0002519	12.486	2.535
3954.02	1.378	0.0002554	12.689	2.529
3963.13	1.378	0.0002569	12.793	2.523
3972.29	1.378	0.0002584	12.897	2.517
3981.48	1.378	0.0002599	13.003	2.512
3990.72	1.378	0.0002678	13.432	2.506
4000.00	1.378	0.0002828	14.217	2.500
4009.22	1.378	0.0003061	15.423	2.494
4018.48	1.378	0.0003575	18.054	2.489
4027.78	1.378	0.0004026	20.376	2.483
4037.12	1.378	0.0004775	24.225	2.477
4046.51	1.378	0.0004856	24.691	2.471
4055.94	1.378	0.0004891	24.930	2.466
4065.42	1.378	0.0004927	25.173	2.460
4074.94	1.378	0.0005013	25.672	2.454
4084.51	1.379	0.0005155	26.458	2.448
4094.12	1.379	0.0005249	27.007	2.443
4103.77	1.379	0.0005405	27.875	2.437
4113.48	1.379	0.0005572	28.801	2.431
4123.22	1.379	0.0005957	30.866	2.425
4133.02	1.379	0.0006167	32.027	2.420
4142.86	1.379	0.0006482	33.746	2.414
4152.75	1.379	0.0006556	34.212	2.408
4162.68	1.379	0.0006451	33.746	2.402
4172.66	1.379	0.0006267	32.860	2.397
4182.69	1.379	0.0005944	31.242	2.391
4192.77	1.379	0.0005789	30.499	2.385

ISO-OCTANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
4202.90	1.379	0.0005775	30.499	2.379
4213.08	1.379	0.0005974	31.629	2.374
4223.30	1.379	0.0006192	32.860	2.368
4233.58	1.379	0.0006259	33.296	2.362
4243.90	1.379	0.0006415	34.212	2.356
4254.28	1.379	0.0006490	34.694	2.351
4264.71	1.379	0.0006567	35.194	2.345
4275.18	1.379	0.0006748	36.251	2.339
4285.71	1.379	0.0007057	38.007	2.333
4296.30	1.379	0.0007413	40.021	2.328
4306.93	1.379	0.0007677	41.548	2.322
4317.62	1.379	0.0007975	43.268	2.316
4328.36	1.378	0.0007228	39.316	2.310
4339.15	1.378	0.0006363	34.694	2.305
4350.00	1.378	0.0006259	34.212	2.299
4360.90	1.378	0.0005996	32.860	2.293
4371.86	1.378	0.0005687	31.242	2.287
4382.87	1.378	0.0005410	29.795	2.282
4393.94	1.378	0.0004841	26.730	2.276
4405.06	1.378	0.0003714	20.558	2.270
4416.24	1.378	0.0003146	17.457	2.264
4427.48	1.378	0.0002434	13.541	2.259
4438.78	1.379	0.0002275	12.689	2.253
4450.13	1.379	0.0001660	9.281	2.247
4461.54	1.379	0.0001504	8.434	2.241
4473.01	1.379	0.0001097	6.168	2.236
4484.54	1.379	0.0000779	4.390	2.230
4496.12	1.379	0.0000624	3.527	2.224
4507.77	1.379	0.0000586	3.320	2.218
4519.48	1.379	0.0000567	3.218	2.213
4531.25	1.379	0.0000556	3.167	2.207
4543.08	1.379	0.0000546	3.116	2.201
4554.97	1.379	0.0000535	3.065	2.195
4566.93	1.379	0.0000500	2.870	2.190
4578.95	1.379	0.0000482	2.774	2.184
4591.03	1.379	0.0000472	2.726	2.178
4603.18	1.379	0.0000447	2.583	2.172
4615.39	1.379	0.0000437	2.536	2.167
4627.66	1.379	0.0000412	2.395	2.161
4640.00	1.379	0.0000403	2.348	2.155
4652.41	1.379	0.0000394	2.302	2.149
4664.88	1.379	0.0000377	2.209	2.144
4677.42	1.379	0.0000368	2.163	2.138
4690.03	1.379	0.0000352	2.072	2.132
4702.70	1.379	0.0000351	2.072	2.126
4715.45	1.379	0.0000350	2.072	2.121
4728.26	1.379	0.0000341	2.026	2.115
4741.14	1.379	0.0000340	2.026	2.109
4754.10	1.379	0.0000332	1.981	2.103
4767.12	1.379	0.0000331	1.981	2.098
4780.22	1.379	0.0000322	1.936	2.092
4793.39	1.379	0.0000314	1.890	2.086
4806.63	1.379	0.0000313	1.890	2.080
4819.95	1.379	0.0000305	1.845	2.075
4833.33	1.379	0.0000304	1.845	2.069
4846.80	1.380	0.0000303	1.845	2.063

ISO-OCTANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
4860.34	1.380	0.0000295	1.801	2.057
4873.95	1.380	0.0000294	1.801	2.052
4887.64	1.380	0.0000293	1.801	2.046
4901.41	1.380	0.0000292	1.801	2.040
4915.25	1.380	0.0000284	1.756	2.034
4929.18	1.380	0.0000283	1.756	2.029
4943.18	1.380	0.0000283	1.756	2.023
4957.27	1.380	0.0000282	1.756	2.017
4971.43	1.380	0.0000281	1.756	2.011
4985.67	1.380	0.0000280	1.756	2.006
5000.00	1.380	0.0000279	1.756	2.000

ISO-PENTANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
670.00	1.349	0.0001854	1.561	14.925
680.00	1.349	0.0001827	1.561	14.706
690.00	1.350	0.0001800	1.561	14.493
700.00	1.350	0.0001775	1.561	14.286
714.29	1.350	0.0001739	1.561	14.000
715.10	1.350	0.0001737	1.561	13.984
715.92	1.350	0.0001732	1.558	13.968
717.57	1.350	0.0001751	1.579	13.936
720.05	1.351	0.0002238	2.025	13.888
720.88	1.351	0.0002169	1.965	13.872
721.71	1.351	0.0002869	2.602	13.856
724.22	1.351	0.0003327	3.028	13.808
725.90	1.351	0.0003386	3.089	13.776
726.74	1.351	0.0003617	3.303	13.760
727.59	1.351	0.0003715	3.397	13.744
729.29	1.351	0.0004730	4.334	13.712
730.14	1.351	0.0004785	4.390	13.696
731.85	1.351	0.0005080	4.672	13.664
732.71	1.351	0.0006118	5.633	13.648
733.57	1.351	0.0006027	5.556	13.632
734.43	1.351	0.0006164	5.689	13.616
736.16	1.352	0.0006758	6.251	13.584
737.03	1.352	0.0007756	7.183	13.568
737.90	1.352	0.0007995	7.414	13.552
739.64	1.352	0.0008232	7.651	13.520
740.52	1.352	0.0009820	9.138	13.504
741.40	1.352	0.0011422	10.642	13.488
742.28	1.352	0.0012042	11.232	13.472
743.16	1.352	0.0012037	11.241	13.456
744.05	1.353	0.0012204	11.411	13.440
744.93	1.353	0.0014794	13.849	13.424
745.82	1.353	0.0017471	16.374	13.408
746.71	1.353	0.0018452	17.314	13.392
747.61	1.353	0.0019058	17.904	13.376
748.50	1.353	0.0022816	21.460	13.360
749.40	1.353	0.0027747	26.130	13.344
750.30	1.354	0.0028086	26.481	13.328
751.20	1.354	0.0034685	32.742	13.312
752.11	1.354	0.0041019	38.768	13.296
753.01	1.353	0.0046128	43.649	13.280
753.92	1.353	0.0045806	43.397	13.264
754.83	1.352	0.0047834	45.373	13.248
756.66	1.352	0.0049797	47.350	13.216
757.58	1.352	0.0051813	49.326	13.200
758.50	1.352	0.0053824	51.302	13.184
760.34	1.352	0.0055762	53.279	13.152
761.27	1.352	0.0060008	57.406	13.136
762.20	1.351	0.0080498	77.102	13.120
763.13	1.349	0.0068529	65.718	13.104
764.99	1.348	0.0068701	66.044	13.072
765.93	1.347	0.0055589	53.504	13.056
766.87	1.347	0.0040236	38.774	13.040
767.81	1.348	0.0037782	36.454	13.024

ISO-PENTANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
768.76	1.348	0.0038153	36.858	13.008
774.47	1.349	0.0040252	39.174	12.912
776.40	1.349	0.0043707	42.643	12.880
777.36	1.349	0.0043768	42.755	12.864
779.30	1.348	0.0048031	47.037	12.832
780.27	1.347	0.0048570	47.624	12.816
781.25	1.347	0.0036213	35.552	12.800
782.23	1.347	0.0035391	34.789	12.784
783.21	1.347	0.0032088	31.582	12.768
784.19	1.348	0.0029310	28.883	12.752
785.18	1.348	0.0028863	28.479	12.736
786.16	1.348	0.0031389	31.010	12.720
787.15	1.349	0.0032063	31.716	12.704
788.15	1.349	0.0036175	35.828	12.688
789.14	1.348	0.0038851	38.527	12.672
791.14	1.348	0.0039227	38.999	12.640
792.14	1.348	0.0041597	41.407	12.624
793.15	1.348	0.0042827	42.685	12.608
794.16	1.348	0.0052098	51.992	12.592
795.17	1.347	0.0049780	49.742	12.576
796.18	1.346	0.0042730	42.751	12.560
797.19	1.346	0.0040134	40.205	12.544
798.21	1.346	0.0035175	35.283	12.528
799.23	1.346	0.0028504	28.628	12.512
800.26	1.346	0.0025998	26.144	12.496
801.28	1.346	0.0023013	23.172	12.480
802.31	1.346	0.0021328	21.503	12.464
803.34	1.346	0.0018770	18.948	12.448
804.38	1.346	0.0017359	17.547	12.432
805.41	1.346	0.0014993	15.175	12.416
806.45	1.346	0.0011951	12.112	12.400
808.54	1.346	0.0011035	11.212	12.368
809.59	1.347	0.0009230	9.390	12.352
810.64	1.347	0.0008451	8.609	12.336
812.74	1.347	0.0007852	8.019	12.304
813.80	1.347	0.0007259	7.423	12.288
814.86	1.347	0.0006223	6.372	12.272
815.93	1.347	0.0005808	5.955	12.256
818.06	1.347	0.0004832	4.967	12.224
820.21	1.348	0.0004465	4.602	12.192
821.29	1.348	0.0004236	4.371	12.176
822.37	1.348	0.0003576	3.696	12.160
823.45	1.348	0.0003527	3.650	12.144
826.72	1.348	0.0003452	3.586	12.096
827.81	1.348	0.0003621	3.767	12.080
830.01	1.348	0.0003015	3.145	12.048
833.33	1.348	0.0002899	3.036	12.000
834.45	1.348	0.0002765	2.900	11.984
836.68	1.348	0.0002275	2.392	11.952
838.93	1.349	0.0002256	2.378	11.920
841.18	1.349	0.0001993	2.107	11.888
843.45	1.349	0.0001772	1.878	11.856
844.59	1.349	0.0001703	1.807	11.840
848.03	1.349	0.0001880	2.004	11.792
849.18	1.349	0.0002048	2.185	11.776

ISO-PENTANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
851.50	1.349	0.0002064	2.208	11.744
854.99	1.349	0.0002230	2.396	11.696
859.70	1.349	0.0002288	2.472	11.632
863.26	1.350	0.0002264	2.456	11.584
866.85	1.350	0.0002755	3.001	11.536
869.26	1.350	0.0002929	3.199	11.504
870.47	1.350	0.0003304	3.614	11.488
871.69	1.350	0.0003365	3.686	11.472
872.91	1.350	0.0003697	4.055	11.456
874.13	1.350	0.0003858	4.238	11.440
876.58	1.350	0.0004014	4.421	11.408
877.81	1.350	0.0004095	4.517	11.392
879.04	1.350	0.0004490	4.960	11.376
880.28	1.351	0.0005051	5.588	11.360
881.52	1.351	0.0005327	5.901	11.344
882.77	1.351	0.0005598	6.210	11.328
884.02	1.351	0.0006084	6.759	11.312
885.27	1.351	0.0006780	7.543	11.296
886.52	1.351	0.0007753	8.637	11.280
887.78	1.351	0.0008785	9.801	11.264
889.05	1.351	0.0009525	10.642	11.248
890.31	1.351	0.0010513	11.762	11.232
892.86	1.351	0.0011377	12.764	11.200
894.13	1.351	0.0010918	12.267	11.184
895.42	1.351	0.0011888	13.377	11.168
897.99	1.351	0.0012166	13.729	11.136
899.28	1.351	0.0012557	14.190	11.120
900.58	1.352	0.0013625	15.420	11.104
901.88	1.352	0.0016086	18.231	11.088
903.18	1.352	0.0019731	22.394	11.072
904.49	1.352	0.0023377	26.570	11.056
905.80	1.352	0.0026839	30.550	11.040
907.11	1.352	0.0029516	33.645	11.024
908.43	1.351	0.0031226	35.646	11.008
909.75	1.351	0.0031691	36.229	10.992
911.08	1.351	0.0032143	36.800	10.976
912.41	1.350	0.0031773	36.430	10.960
913.74	1.350	0.0030549	35.077	10.944
915.08	1.350	0.0029026	33.378	10.928
916.42	1.350	0.0027284	31.420	10.912
917.77	1.350	0.0025241	29.111	10.896
919.12	1.350	0.0022604	26.108	10.880
920.47	1.350	0.0020073	23.219	10.864
921.83	1.350	0.0019144	22.177	10.848
923.19	1.350	0.0017847	20.704	10.832
924.56	1.350	0.0016558	19.238	10.816
925.93	1.350	0.0015617	18.171	10.800
927.30	1.350	0.0014512	16.911	10.784
928.68	1.350	0.0012738	14.865	10.768
930.06	1.351	0.0010738	12.550	10.752
931.45	1.351	0.0017672	20.685	10.736
932.84	1.351	0.0016535	19.383	10.720
934.23	1.351	0.0015788	18.535	10.704
935.63	1.351	0.0015347	18.044	10.688
937.03	1.351	0.0015248	17.955	10.672

ISO-PENTANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
938.44	1.351	0.0015378	18.135	10.656
939.85	1.352	0.0015591	18.413	10.640
941.27	1.352	0.0016273	19.249	10.624
942.68	1.352	0.0017253	20.438	10.608
944.11	1.352	0.0017663	20.956	10.592
945.54	1.352	0.0018577	22.073	10.576
946.97	1.352	0.0020222	24.064	10.560
948.41	1.353	0.0022704	27.059	10.544
949.85	1.352	0.0024957	29.789	10.528
952.74	1.353	0.0014491	17.350	10.496
954.20	1.354	0.0017487	20.969	10.480
955.66	1.354	0.0020980	25.195	10.464
957.12	1.355	0.0025413	30.566	10.448
958.59	1.355	0.0030045	36.192	10.432
960.06	1.356	0.0030162	36.389	10.416
961.54	1.357	0.0040921	49.445	10.400
963.02	1.358	0.0056277	68.105	10.384
964.51	1.358	0.0072554	87.938	10.368
966.00	1.358	0.0103682	125.861	10.352
967.49	1.356	0.0125615	152.720	10.336
968.99	1.353	0.0150190	182.882	10.320
970.50	1.351	0.0134699	164.274	10.304
972.01	1.349	0.0142772	174.391	10.288
973.52	1.346	0.0135095	165.270	10.272
975.04	1.344	0.0104393	127.910	10.256
976.56	1.344	0.0081941	100.556	10.240
978.09	1.344	0.0070515	86.670	10.224
979.62	1.344	0.0059061	72.706	10.208
981.16	1.344	0.0043693	53.872	10.192
982.70	1.345	0.0030347	37.475	10.176
984.25	1.345	0.0026577	32.871	10.160
985.80	1.346	0.0019251	23.849	10.144
987.36	1.347	0.0011243	13.950	10.128
988.92	1.348	0.0013395	16.647	10.112
990.49	1.349	0.0016241	20.215	10.096
992.06	1.350	0.0017526	21.849	10.080
993.64	1.351	0.0026909	33.600	10.064
995.22	1.351	0.0029283	36.623	10.048
996.81	1.352	0.0039540	49.529	10.032
998.40	1.352	0.0047296	59.339	10.016
1000.00	1.352	0.0050940	64.014	10.000
1001.60	1.352	0.0061826	77.817	9.984
1003.21	1.351	0.0072063	90.848	9.968
1004.82	1.350	0.0078189	98.729	9.952
1006.44	1.350	0.0080554	101.879	9.936
1008.06	1.349	0.0094010	119.088	9.920
1009.69	1.348	0.0090917	115.357	9.904
1011.33	1.347	0.0087892	111.700	9.888
1012.97	1.345	0.0086071	109.562	9.872
1014.61	1.344	0.0072733	92.734	9.856
1016.26	1.344	0.0056447	72.087	9.840
1017.92	1.344	0.0051242	65.547	9.824
1019.58	1.344	0.0046812	59.977	9.808
1021.24	1.345	0.0035327	45.337	9.792
1022.91	1.345	0.0035137	45.167	9.776

ISO-PENTANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
1024.59	1.346	0.0034801	44.808	9.760
1026.27	1.346	0.0033040	42.610	9.744
1027.96	1.346	0.0037070	47.886	9.728
1029.65	1.346	0.0037950	49.103	9.712
1031.35	1.346	0.0038659	50.103	9.696
1033.06	1.345	0.0037679	48.914	9.680
1034.77	1.345	0.0036060	46.890	9.664
1036.48	1.345	0.0028410	37.003	9.648
1038.21	1.345	0.0023287	30.382	9.632
1039.93	1.345	0.0017819	23.286	9.616
1043.41	1.346	0.0016126	21.145	9.584
1045.15	1.346	0.0013747	18.055	9.568
1046.90	1.346	0.0012119	15.943	9.552
1048.66	1.346	0.0010565	13.923	9.536
1050.42	1.346	0.0009852	13.004	9.520
1052.19	1.347	0.0008987	11.882	9.504
1053.96	1.347	0.0008374	11.091	9.488
1055.74	1.347	0.0007619	10.108	9.472
1057.53	1.347	0.0007360	9.781	9.456
1059.32	1.347	0.0006714	8.937	9.440
1061.12	1.347	0.0006469	8.627	9.424
1062.93	1.348	0.0005809	7.760	9.408
1064.74	1.348	0.0005594	7.484	9.392
1068.38	1.348	0.0005087	6.829	9.360
1072.04	1.348	0.0004950	6.668	9.328
1073.88	1.348	0.0004645	6.269	9.312
1077.59	1.349	0.0005886	7.971	9.280
1079.45	1.349	0.0006051	8.208	9.264
1081.31	1.349	0.0005384	7.316	9.248
1085.07	1.349	0.0004248	5.792	9.216
1086.96	1.349	0.0004454	6.084	9.200
1088.85	1.349	0.0004451	6.090	9.184
1090.75	1.349	0.0004934	6.763	9.168
1092.66	1.350	0.0005025	6.900	9.152
1094.57	1.350	0.0005086	6.996	9.136
1098.42	1.350	0.0005233	7.223	9.104
1100.35	1.350	0.0005697	7.878	9.088
1102.29	1.350	0.0006205	8.595	9.072
1104.24	1.351	0.0006612	9.174	9.056
1106.19	1.351	0.0007379	10.257	9.040
1108.16	1.351	0.0007874	10.965	9.024
1110.12	1.351	0.0008719	12.164	9.008
1112.10	1.351	0.0009179	12.828	8.992
1114.08	1.352	0.0012253	17.155	8.976
1116.07	1.352	0.0014116	19.798	8.960
1118.07	1.352	0.0016314	22.922	8.944
1120.07	1.352	0.0019331	27.209	8.928
1122.08	1.353	0.0022408	31.597	8.912
1124.10	1.353	0.0029705	41.961	8.896
1126.13	1.353	0.0033230	47.026	8.880
1128.16	1.353	0.0038857	55.088	8.864
1130.20	1.353	0.0044479	63.172	8.848
1132.25	1.352	0.0050081	71.256	8.832
1136.36	1.352	0.0052493	74.959	8.800
1138.43	1.352	0.0063795	91.265	8.784

ISO-PENTANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
1140.51	1.351	0.0071571	102.576	8.768
1142.60	1.349	0.0081212	116.606	8.752
1144.69	1.347	0.0070826	101.881	8.736
1146.79	1.346	0.0053875	77.640	8.720
1148.90	1.346	0.0037619	54.312	8.704
1151.01	1.347	0.0024287	35.128	8.688
1153.14	1.348	0.0016698	24.197	8.672
1155.27	1.349	0.0017016	24.704	8.656
1157.41	1.349	0.0016531	24.043	8.640
1159.55	1.350	0.0019280	28.094	8.624
1161.71	1.351	0.0024775	36.168	8.608
1163.87	1.351	0.0034439	50.369	8.592
1166.04	1.351	0.0041961	61.485	8.576
1168.22	1.350	0.0049950	73.329	8.560
1170.41	1.350	0.0055560	81.716	8.544
1172.61	1.348	0.0056193	82.803	8.528
1174.81	1.347	0.0049170	72.590	8.512
1177.02	1.347	0.0037335	55.221	8.496
1179.25	1.347	0.0027813	41.216	8.480
1181.47	1.348	0.0022866	33.948	8.464
1188.21	1.348	0.0020866	31.156	8.416
1190.48	1.348	0.0018960	28.364	8.400
1192.75	1.348	0.0017061	25.572	8.384
1195.03	1.349	0.0015012	22.544	8.368
1197.32	1.349	0.0013474	20.273	8.352
1199.62	1.349	0.0012473	18.803	8.336
1201.92	1.349	0.0011894	17.965	8.320
1204.24	1.350	0.0011808	17.869	8.304
1213.59	1.350	0.0011084	16.904	8.240
1215.95	1.350	0.0010855	16.587	8.224
1218.32	1.351	0.0010838	16.592	8.208
1220.70	1.351	0.0011296	17.327	8.192
1223.09	1.351	0.0011884	18.265	8.176
1225.49	1.351	0.0012565	19.350	8.160
1227.90	1.351	0.0013131	20.262	8.144
1230.31	1.351	0.0013432	20.767	8.128
1232.74	1.351	0.0013648	21.142	8.112
1237.62	1.352	0.0014211	22.101	8.080
1240.08	1.352	0.0014939	23.280	8.064
1242.54	1.352	0.0015955	24.912	8.048
1245.02	1.352	0.0017060	26.691	8.032
1247.50	1.352	0.0018210	28.547	8.016
1250.00	1.352	0.0019028	29.889	8.000
1252.51	1.352	0.0021043	33.121	7.984
1257.55	1.353	0.0022207	35.093	7.952
1260.08	1.353	0.0023607	37.380	7.936
1262.63	1.352	0.0022760	36.112	7.920
1265.18	1.352	0.0022169	35.247	7.904
1267.75	1.352	0.0018742	29.858	7.888
1270.33	1.353	0.0016431	26.229	7.872
1272.91	1.353	0.0016230	25.961	7.856
1275.51	1.354	0.0018297	29.327	7.840
1278.12	1.354	0.0020776	33.369	7.824
1280.74	1.354	0.0021876	35.208	7.808
1283.37	1.354	0.0022089	35.623	7.792

ISO-PENTANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
1286.01	1.355	0.0021943	35.461	7.776
1288.66	1.355	0.0027188	44.028	7.760
1291.32	1.355	0.0034972	56.750	7.744
1294.00	1.354	0.0037020	60.198	7.728
1296.68	1.354	0.0034767	56.651	7.712
1299.38	1.354	0.0029597	48.328	7.696
1302.08	1.354	0.0025445	41.635	7.680
1304.80	1.354	0.0023160	37.974	7.664
1307.53	1.355	0.0019888	32.678	7.648
1310.27	1.355	0.0016361	26.939	7.632
1313.03	1.356	0.0015110	24.931	7.616
1315.79	1.356	0.0011877	19.637	7.600
1318.57	1.357	0.0011985	19.859	7.584
1321.35	1.358	0.0013848	22.994	7.568
1324.15	1.359	0.0019042	31.686	7.552
1326.96	1.360	0.0026334	43.911	7.536
1329.79	1.361	0.0035933	60.046	7.520
1332.62	1.361	0.0045905	76.873	7.504
1335.47	1.361	0.0051926	87.143	7.488
1338.33	1.361	0.0053932	90.702	7.472
1341.20	1.361	0.0055146	92.943	7.456
1344.09	1.362	0.0055180	93.200	7.440
1346.98	1.363	0.0058997	99.862	7.424
1349.89	1.364	0.0060870	103.255	7.408
1352.81	1.366	0.0068942	117.200	7.392
1355.75	1.369	0.0073980	126.039	7.376
1358.70	1.371	0.0125793	214.778	7.360
1361.66	1.371	0.0165997	284.040	7.344
1364.63	1.369	0.0206859	354.731	7.328
1367.61	1.366	0.0217464	373.732	7.312
1370.61	1.366	0.0241517	415.979	7.296
1373.63	1.363	0.0281268	485.511	7.280
1376.65	1.357	0.0303024	524.216	7.264
1379.69	1.351	0.0285845	495.589	7.248
1382.74	1.347	0.0244700	425.192	7.232
1385.81	1.346	0.0194035	337.905	7.216
1388.89	1.347	0.0166159	290.002	7.200
1391.98	1.349	0.0148756	260.206	7.184
1395.09	1.350	0.0136343	239.026	7.168
1398.21	1.352	0.0129628	227.762	7.152
1401.35	1.354	0.0128067	225.524	7.136
1404.49	1.355	0.0141731	250.146	7.120
1407.66	1.355	0.0138390	244.801	7.104
1410.84	1.356	0.0149845	265.662	7.088
1414.03	1.357	0.0158037	280.819	7.072
1417.23	1.357	0.0164005	292.083	7.056
1420.45	1.358	0.0167459	298.913	7.040
1423.69	1.359	0.0184897	330.792	7.024
1426.94	1.359	0.0189324	339.485	7.008
1430.21	1.360	0.0200643	360.607	6.992
1433.49	1.361	0.0199510	359.392	6.976
1436.78	1.365	0.0219260	395.876	6.960
1440.09	1.367	0.0263483	476.817	6.944
1443.42	1.370	0.0297842	540.242	6.928
1446.76	1.372	0.0393588	715.564	6.912

ISO-PENTANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
1450.12	1.371	0.0487822	888.946	6.896
1453.49	1.361	0.0648412	1184.330	6.880
1456.88	1.345	0.0672714	1231.585	6.864
1460.28	1.330	0.0666977	1223.931	6.848
1463.70	1.317	0.0577349	1061.941	6.832
1467.14	1.309	0.0477826	880.949	6.816
1470.59	1.305	0.0359925	665.140	6.800
1474.06	1.307	0.0252824	468.321	6.784
1477.54	1.311	0.0210066	390.035	6.768
1481.04	1.314	0.0168755	314.075	6.752
1484.56	1.316	0.0161724	301.705	6.736
1488.10	1.317	0.0140369	262.490	6.720
1491.65	1.318	0.0130080	243.831	6.704
1495.22	1.318	0.0119166	223.906	6.688
1498.80	1.316	0.0092482	174.184	6.672
1502.40	1.318	0.0027905	52.683	6.656
1506.02	1.323	0.0025914	49.042	6.640
1509.66	1.325	0.0020933	39.712	6.624
1513.32	1.326	0.0018333	34.864	6.608
1535.63	1.332	0.0017244	33.277	6.512
1539.41	1.332	0.0016381	31.690	6.496
1543.21	1.333	0.0015523	30.102	6.480
1547.03	1.333	0.0014741	28.658	6.464
1550.87	1.334	0.0014277	27.825	6.448
1554.73	1.334	0.0014050	27.450	6.432
1558.60	1.335	0.0013522	26.484	6.416
1562.50	1.335	0.0013303	26.121	6.400
1566.42	1.335	0.0011847	23.320	6.384
1570.35	1.336	0.0011031	21.768	6.368
1574.31	1.336	0.0010266	20.310	6.352
1578.28	1.336	0.0009768	19.374	6.336
1582.28	1.337	0.0009178	18.250	6.320
1586.29	1.337	0.0008551	17.045	6.304
1590.33	1.337	0.0008127	16.241	6.288
1594.39	1.337	0.0008022	16.072	6.272
1598.47	1.338	0.0008106	16.283	6.256
1602.56	1.338	0.0008075	16.262	6.240
1606.68	1.338	0.0007959	16.069	6.224
1610.82	1.338	0.0007937	16.067	6.208
1614.99	1.339	0.0008018	16.273	6.192
1619.17	1.339	0.0008220	16.726	6.176
1623.38	1.339	0.0008145	16.617	6.160
1627.60	1.339	0.0008598	17.586	6.144
1631.85	1.339	0.0009015	18.486	6.128
1636.13	1.339	0.0009166	18.846	6.112
1640.42	1.340	0.0009645	19.882	6.096
1644.74	1.340	0.0010178	21.037	6.080
1653.44	1.340	0.0011158	23.183	6.048
1662.23	1.340	0.0010841	22.644	6.016
1666.67	1.340	0.0011062	23.169	6.000
1671.12	1.340	0.0011269	23.666	5.984
1675.60	1.340	0.0010603	22.325	5.968
1680.11	1.340	0.0009707	20.494	5.952
1689.19	1.340	0.0009162	19.448	5.920
1693.77	1.340	0.0008950	19.049	5.904

ISO-PENTANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
1698.37	1.340	0.0008622	18.400	5.888
1703.00	1.341	0.0007804	16.701	5.872
1707.65	1.341	0.0007402	15.885	5.856
1712.33	1.341	0.0007087	15.250	5.840
1717.03	1.341	0.0006544	14.119	5.824
1726.52	1.341	0.0006198	13.448	5.792
1731.30	1.341	0.0006076	13.219	5.776
1736.11	1.341	0.0005769	12.586	5.760
1740.95	1.341	0.0005674	12.414	5.744
1745.81	1.341	0.0005283	11.591	5.728
1750.70	1.341	0.0004857	10.686	5.712
1755.62	1.341	0.0004801	10.591	5.696
1760.56	1.341	0.0004215	9.326	5.680
1765.54	1.342	0.0003942	8.746	5.664
1770.54	1.342	0.0003488	7.761	5.648
1775.57	1.342	0.0003307	7.378	5.632
1780.63	1.342	0.0003370	7.540	5.616
1790.83	1.342	0.0003319	7.470	5.584
1795.98	1.342	0.0003216	7.259	5.568
1801.15	1.342	0.0002818	6.378	5.552
1806.36	1.342	0.0002838	6.443	5.536
1811.59	1.342	0.0002835	6.454	5.520
1816.86	1.342	0.0003164	7.223	5.504
1822.16	1.342	0.0003382	7.743	5.488
1827.49	1.342	0.0003507	8.054	5.472
1832.84	1.342	0.0003426	7.891	5.456
1838.24	1.343	0.0003131	7.233	5.440
1843.66	1.343	0.0002773	6.424	5.424
1849.11	1.343	0.0002517	5.850	5.408
1851.85	1.343	0.0002361	5.495	5.400
1854.60	1.343	0.0002198	5.124	5.392
1857.36	1.343	0.0002100	4.902	5.384
1860.12	1.343	0.0002086	4.876	5.376
1862.89	1.343	0.0002012	4.711	5.368
1865.67	1.343	0.0002064	4.838	5.360
1868.46	1.343	0.0001999	4.695	5.352
1871.26	1.343	0.0002013	4.734	5.344
1874.06	1.343	0.0001933	4.552	5.336
1876.88	1.343	0.0001880	4.433	5.328
1879.70	1.343	0.0001768	4.177	5.320
1882.53	1.343	0.0001686	3.987	5.312
1885.37	1.343	0.0001598	3.786	5.304
1888.22	1.343	0.0001530	3.631	5.296
1891.07	1.343	0.0001446	3.437	5.288
1893.94	1.343	0.0001468	3.494	5.280
1896.81	1.343	0.0001409	3.359	5.272
1899.70	1.343	0.0001472	3.513	5.264
1902.59	1.343	0.0001516	3.625	5.256
1905.49	1.343	0.0001570	3.759	5.248
1908.40	1.343	0.0001666	3.996	5.240
1911.31	1.343	0.0001696	4.073	5.232
1914.24	1.343	0.0001854	4.460	5.224
1917.18	1.343	0.0001972	4.752	5.216
1920.12	1.343	0.0002072	4.998	5.208
1923.08	1.343	0.0002217	5.357	5.200

ISO-PENTANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
1926.04	1.343	0.0002355	5.699	5.192
1929.01	1.343	0.0002382	5.774	5.184
1931.99	1.343	0.0002436	5.914	5.176
1934.98	1.343	0.0002365	5.750	5.168
1937.98	1.344	0.0002265	5.516	5.160
1940.99	1.344	0.0002101	5.124	5.152
1944.01	1.344	0.0001958	4.784	5.144
1947.04	1.344	0.0001783	4.364	5.136
1950.08	1.344	0.0001641	4.021	5.128
1953.13	1.344	0.0001446	3.550	5.120
1956.18	1.344	0.0001326	3.260	5.112
1959.25	1.344	0.0001249	3.075	5.104
1962.32	1.344	0.0001190	2.933	5.096
1965.41	1.344	0.0001075	2.655	5.088
1968.50	1.344	0.0001030	2.547	5.080
1971.61	1.344	0.0000954	2.362	5.072
1974.72	1.344	0.0000887	2.200	5.064
1977.85	1.344	0.0000799	1.985	5.056
1980.98	1.344	0.0000725	1.804	5.048
1984.13	1.344	0.0000696	1.736	5.040
1987.28	1.344	0.0000633	1.581	5.032
1990.45	1.344	0.0000652	1.630	5.024
1993.62	1.344	0.0000618	1.549	5.016
1996.81	1.344	0.0000605	1.519	5.008
2000.00	1.344	0.0000619	1.556	5.000
2003.21	1.344	0.0000599	1.508	4.992
2006.42	1.344	0.0000624	1.573	4.984
2009.65	1.344	0.0000645	1.628	4.976
2012.88	1.344	0.0000667	1.687	4.968
2016.13	1.344	0.0000743	1.883	4.960
2019.39	1.344	0.0000749	1.900	4.952
2022.65	1.344	0.0000856	2.176	4.944
2025.93	1.344	0.0000898	2.285	4.936
2029.22	1.344	0.0000984	2.509	4.928
2032.52	1.344	0.0001052	2.686	4.920
2035.83	1.344	0.0001918	4.906	4.912
2039.15	1.344	0.0001952	5.002	4.904
2042.48	1.344	0.0001956	5.020	4.896
2045.83	1.344	0.0001990	5.115	4.888
2049.18	1.345	0.0001989	5.123	4.880
2052.55	1.345	0.0002031	5.239	4.872
2055.92	1.345	0.0002116	5.468	4.864
2059.31	1.345	0.0002117	5.478	4.856
2062.71	1.345	0.0002073	5.374	4.848
2066.12	1.345	0.0001989	5.165	4.840
2069.54	1.345	0.0001937	5.037	4.832
2072.97	1.345	0.0001887	4.916	4.824
2076.41	1.345	0.0001907	4.977	4.816
2079.87	1.345	0.0001929	5.043	4.808
2083.33	1.345	0.0001995	5.223	4.800
2086.81	1.345	0.0002077	5.446	4.792
2090.30	1.345	0.0002108	5.537	4.784
2093.80	1.345	0.0002155	5.670	4.776
2097.32	1.345	0.0002109	5.559	4.768
2100.84	1.345	0.0002134	5.635	4.760

ISO-PENTANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
2104.38	1.345	0.0002090	5.527	4.752
2107.93	1.345	0.0002133	5.651	4.744
2111.49	1.345	0.0002133	5.660	4.736
2115.06	1.345	0.0002231	5.931	4.728
2118.64	1.345	0.0002295	6.109	4.720
2122.24	1.345	0.0002438	6.502	4.712
2125.85	1.345	0.0002443	6.527	4.704
2129.47	1.345	0.0002502	6.695	4.696
2133.11	1.345	0.0002425	6.501	4.688
2136.75	1.345	0.0002384	6.400	4.680
2140.41	1.345	0.0002276	6.120	4.672
2144.08	1.345	0.0002194	5.910	4.664
2147.77	1.345	0.0002163	5.838	4.656
2151.46	1.345	0.0002172	5.872	4.648
2155.17	1.345	0.0002235	6.053	4.640
2158.89	1.345	0.0002331	6.324	4.632
2162.63	1.345	0.0002432	6.610	4.624
2166.38	1.345	0.0002492	6.783	4.616
2170.14	1.345	0.0002529	6.896	4.608
2173.91	1.345	0.0002452	6.698	4.600
2177.70	1.345	0.0002363	6.467	4.592
2181.50	1.345	0.0002213	6.067	4.584
2185.31	1.345	0.0002091	5.741	4.576
2189.14	1.345	0.0002003	5.510	4.568
2192.98	1.345	0.0001957	5.393	4.560
2196.84	1.345	0.0001943	5.365	4.552
2200.70	1.346	0.0002034	5.624	4.544
2204.59	1.346	0.0002067	5.727	4.536
2208.48	1.346	0.0002178	6.044	4.528
2212.39	1.346	0.0002207	6.135	4.520
2216.31	1.346	0.0002283	6.359	4.512
2220.25	1.346	0.0002370	6.614	4.504
2224.20	1.346	0.0002499	6.985	4.496
2228.16	1.346	0.0002622	7.343	4.488
2232.14	1.346	0.0003167	8.882	4.480
2236.14	1.346	0.0003198	8.987	4.472
2240.14	1.346	0.0003359	9.455	4.464
2244.17	1.346	0.0003622	10.215	4.456
2248.20	1.346	0.0003801	10.739	4.448
2252.25	1.346	0.0004006	11.339	4.440
2256.32	1.346	0.0004131	11.713	4.432
2260.40	1.346	0.0004248	12.065	4.424
2264.49	1.346	0.0004312	12.270	4.416
2268.60	1.346	0.0004382	12.492	4.408
2272.73	1.346	0.0004370	12.480	4.400
2276.87	1.346	0.0004400	12.589	4.392
2281.02	1.346	0.0004329	12.407	4.384
2285.19	1.346	0.0004292	12.325	4.376
2289.38	1.346	0.0004170	11.997	4.368
2293.58	1.346	0.0004119	11.872	4.360
2297.79	1.346	0.0004009	11.576	4.352
2302.03	1.346	0.0003898	11.277	4.344
2306.27	1.346	0.0003922	11.367	4.336
2310.54	1.346	0.0003864	11.219	4.328
2314.81	1.346	0.0003752	10.914	4.320

ISO-PENTANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
2319.11	1.346	0.0003699	10.779	4.312
2323.42	1.346	0.0003608	10.534	4.304
2327.75	1.346	0.0003591	10.503	4.296
2332.09	1.346	0.0003580	10.492	4.288
2336.45	1.347	0.0003635	10.674	4.280
2340.82	1.347	0.0003792	11.156	4.272
2345.22	1.347	0.0004014	11.829	4.264
2349.62	1.347	0.0004316	12.744	4.256
2354.05	1.347	0.0004688	13.869	4.248
2358.49	1.347	0.0005053	14.976	4.240
2362.95	1.347	0.0005233	15.539	4.232
2367.42	1.347	0.0005436	16.173	4.224
2371.92	1.347	0.0005506	16.411	4.216
2376.43	1.347	0.0005494	16.407	4.208
2380.95	1.347	0.0005459	16.333	4.200
2385.50	1.347	0.0005429	16.274	4.192
2390.06	1.347	0.0005442	16.346	4.184
2394.64	1.347	0.0005445	16.386	4.176
2399.23	1.347	0.0005442	16.407	4.168
2403.85	1.347	0.0005417	16.364	4.160
2408.48	1.347	0.0005348	16.185	4.152
2413.13	1.347	0.0005166	15.667	4.144
2417.79	1.347	0.0004983	15.139	4.136
2422.48	1.347	0.0004677	14.237	4.128
2427.18	1.347	0.0004470	13.634	4.120
2431.91	1.347	0.0004270	13.049	4.112
2436.65	1.347	0.0004138	12.670	4.104
2441.41	1.347	0.0004013	12.312	4.096
2446.18	1.347	0.0003985	12.251	4.088
2450.98	1.347	0.0003960	12.198	4.080
2455.80	1.347	0.0003936	12.147	4.072
2460.63	1.348	0.0003920	12.122	4.064
2465.48	1.348	0.0003844	11.911	4.056
2470.36	1.348	0.0003812	11.832	4.048
2475.25	1.348	0.0003761	11.699	4.040
2480.16	1.348	0.0003737	11.647	4.032
2485.09	1.348	0.0003732	11.653	4.024
2490.04	1.348	0.0003743	11.711	4.016
2495.01	1.348	0.0003762	11.794	4.008
2500.00	1.348	0.0003715	11.671	4.000
2505.01	1.348	0.0003678	11.579	3.992
2510.04	1.348	0.0003581	11.296	3.984
2515.09	1.348	0.0003486	11.016	3.976
2520.16	1.349	0.0003423	10.842	3.968
2525.25	1.349	0.0003369	10.691	3.960
2530.36	1.349	0.0003434	10.919	3.952
2535.50	1.349	0.0003580	11.405	3.944
2540.65	1.349	0.0004378	13.979	3.936
2545.82	1.349	0.0004389	14.042	3.928
2551.02	1.349	0.0004967	15.922	3.920
2556.24	1.350	0.0005767	18.526	3.912
2561.48	1.350	0.0006857	22.072	3.904
2566.74	1.350	0.0008105	26.143	3.896
2572.02	1.350	0.0009828	31.764	3.888
2577.32	1.350	0.0011405	36.937	3.880

ISO-PENTANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
2582.64	1.350	0.0013373	43.401	3.872
2587.99	1.350	0.0015019	48.844	3.864
2593.36	1.350	0.0016129	52.564	3.856
2598.75	1.350	0.0016665	54.424	3.848
2604.17	1.350	0.0016745	54.799	3.840
2609.60	1.350	0.0016749	54.926	3.832
2615.06	1.350	0.0016442	54.032	3.824
2620.55	1.350	0.0016062	52.893	3.816
2626.05	1.350	0.0015419	50.882	3.808
2631.58	1.350	0.0014858	49.136	3.800
2637.13	1.350	0.0014081	46.663	3.792
2642.71	1.351	0.0013679	45.427	3.784
2648.31	1.351	0.0013258	44.123	3.776
2653.93	1.351	0.0013221	44.094	3.768
2659.57	1.351	0.0012979	43.376	3.760
2665.25	1.352	0.0013203	44.222	3.752
2670.94	1.352	0.0013353	44.817	3.744
2676.66	1.352	0.0018440	62.025	3.736
2682.40	1.352	0.0018776	63.289	3.728
2688.17	1.352	0.0019659	66.411	3.720
2693.97	1.352	0.0015981	54.100	3.712
2699.78	1.353	0.0017586	59.662	3.704
2705.63	1.353	0.0018869	64.156	3.696
2711.50	1.353	0.0021514	73.305	3.688
2717.39	1.354	0.0022529	76.931	3.680
2723.31	1.354	0.0027216	93.137	3.672
2729.26	1.354	0.0030778	105.558	3.664
2735.23	1.354	0.0024234	83.297	3.656
2741.23	1.354	0.0025460	87.702	3.648
2747.25	1.354	0.0026848	92.686	3.640
2753.30	1.355	0.0023723	82.080	3.632
2759.38	1.355	0.0022517	78.078	3.624
2765.49	1.355	0.0019820	68.878	3.616
2771.62	1.356	0.0016136	56.201	3.608
2777.78	1.357	0.0012051	42.065	3.600
2783.96	1.358	0.0010196	35.669	3.592
2790.18	1.359	0.0008669	30.396	3.584
2796.42	1.361	0.0009628	33.834	3.576
2802.69	1.363	0.0007176	25.274	3.568
2808.99	1.366	0.0020489	72.323	3.560
2815.32	1.368	0.0033530	118.624	3.552
2821.67	1.369	0.0054967	194.904	3.544
2828.05	1.373	0.0049932	177.449	3.536
2834.47	1.377	0.0113445	404.078	3.528
2840.91	1.377	0.0149584	534.013	3.520
2847.38	1.379	0.0196433	702.860	3.512
2853.88	1.379	0.0251503	901.964	3.504
2860.41	1.377	0.0312897	1124.709	3.496
2866.97	1.374	0.0347950	1253.575	3.488
2873.56	1.370	0.0386221	1394.654	3.480
2880.18	1.366	0.0408760	1479.442	3.472
2886.84	1.363	0.0417963	1516.248	3.464
2893.52	1.361	0.0434220	1578.870	3.456
2900.23	1.358	0.0457753	1668.297	3.448
2906.98	1.355	0.0481052	1757.293	3.440

ISO-PENTANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
2913.75	1.352	0.0507466	1858.100	3.432
2920.56	1.348	0.0541749	1988.265	3.424
2927.40	1.340	0.0590949	2173.912	3.416
2934.27	1.328	0.0585057	2157.288	3.408
2941.18	1.317	0.0526951	1947.607	3.400
2948.11	1.310	0.0446614	1654.573	3.392
2955.08	1.306	0.0347951	1292.103	3.384
2962.09	1.304	0.0283754	1056.209	3.376
2969.12	1.304	0.0182273	680.078	3.368
2976.19	1.307	0.0131840	493.081	3.360
2983.29	1.309	0.0078121	292.869	3.352
2990.43	1.315	0.0041187	154.777	3.344
3026.63	1.326	0.0027563	104.832	3.304
3033.98	1.327	0.0021315	81.268	3.296
3041.36	1.328	0.0020016	76.498	3.288
3048.78	1.329	0.0017283	66.217	3.280
3056.23	1.330	0.0016391	62.951	3.272
3063.73	1.330	0.0014535	55.959	3.264
3071.25	1.331	0.0013646	52.666	3.256
3078.82	1.332	0.0012605	48.769	3.248
3086.42	1.332	0.0012048	46.730	3.240
3094.06	1.333	0.0011553	44.919	3.232
3101.74	1.333	0.0011499	44.820	3.224
3109.45	1.334	0.0011651	45.524	3.216
3117.21	1.334	0.0011597	45.428	3.208
3125.00	1.334	0.0012127	47.623	3.200
3132.83	1.335	0.0012666	49.866	3.192
3140.70	1.335	0.0013559	53.512	3.184
3148.61	1.335	0.0014331	56.701	3.176
3156.57	1.335	0.0014581	57.838	3.168
3164.56	1.335	0.0014379	57.183	3.160
3172.59	1.335	0.0013223	52.716	3.152
3180.66	1.336	0.0011856	47.387	3.144
3188.78	1.336	0.0010534	42.212	3.136
3196.93	1.336	0.0009008	36.187	3.128
3205.13	1.336	0.0007805	31.437	3.120
3213.37	1.336	0.0006438	25.999	3.112
3221.65	1.337	0.0005477	22.173	3.104
3229.97	1.337	0.0004574	18.567	3.096
3238.34	1.337	0.0003966	16.138	3.088
3246.75	1.337	0.0003482	14.205	3.080
3255.21	1.337	0.0003245	13.272	3.072
3263.71	1.338	0.0003100	12.714	3.064
3272.25	1.338	0.0003165	13.015	3.056
3280.84	1.338	0.0003300	13.606	3.048
3289.47	1.338	0.0003476	14.370	3.040
3298.15	1.338	0.0003735	15.480	3.032
3306.88	1.338	0.0003851	16.002	3.024
3315.65	1.338	0.0003900	16.251	3.016
3324.47	1.339	0.0003774	15.768	3.008
3333.33	1.339	0.0003580	14.994	3.000
3342.25	1.339	0.0003312	13.911	2.992
3351.21	1.339	0.0003046	12.829	2.984
3360.22	1.339	0.0002815	11.885	2.976
3369.27	1.339	0.0002571	10.887	2.968

ISO-PENTANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
3378.38	1.339	0.0002401	10.194	2.960
3387.53	1.339	0.0002199	9.363	2.952
3396.74	1.339	0.0002013	8.594	2.944
3405.99	1.339	0.0001827	7.819	2.936
3415.30	1.339	0.0001559	6.693	2.928
3424.66	1.340	0.0001332	5.733	2.920
3434.07	1.340	0.0001139	4.916	2.912
3443.53	1.340	0.0000972	4.208	2.904
3453.04	1.340	0.0000826	3.584	2.896
3462.60	1.340	0.0000714	3.106	2.888
3472.22	1.340	0.0000621	2.709	2.880
3481.89	1.340	0.0000576	2.518	2.872
3491.62	1.340	0.0000529	2.321	2.864
3501.40	1.340	0.0000493	2.171	2.856
3511.24	1.340	0.0000461	2.033	2.848
3521.13	1.340	0.0000433	1.918	2.840
3531.07	1.340	0.0000442	1.960	2.832
3541.08	1.341	0.0000451	2.006	2.824
3551.14	1.341	0.0000481	2.145	2.816
3561.25	1.341	0.0000534	2.390	2.808
3571.43	1.341	0.0000602	2.700	2.800
3581.66	1.341	0.0000685	3.083	2.792
3591.95	1.341	0.0000805	3.633	2.784
3602.31	1.341	0.0000919	4.158	2.776
3612.72	1.341	0.0001047	4.753	2.768
3623.19	1.341	0.0001143	5.203	2.760
3633.72	1.341	0.0001262	5.761	2.752
3644.31	1.341	0.0001353	6.198	2.744
3654.97	1.341	0.0001413	6.489	2.736
3665.69	1.341	0.0001432	6.597	2.728
3676.47	1.341	0.0001451	6.702	2.720
3687.32	1.341	0.0001459	6.759	2.712
3698.22	1.341	0.0001455	6.763	2.704
3709.20	1.341	0.0001507	7.026	2.696
3720.24	1.341	0.0001586	7.413	2.688
3731.34	1.342	0.0001695	7.947	2.680
3742.51	1.342	0.0001833	8.622	2.672
3753.75	1.342	0.0002008	9.472	2.664
3765.06	1.342	0.0002163	10.233	2.656
3776.44	1.342	0.0002289	10.863	2.648
3787.88	1.342	0.0002441	11.621	2.640
3799.39	1.342	0.0002585	12.342	2.632
3810.98	1.342	0.0002744	13.141	2.624
3822.63	1.342	0.0002838	13.633	2.616
3834.36	1.342	0.0002913	14.037	2.608
3846.15	1.342	0.0003019	14.591	2.600
3858.02	1.342	0.0003075	14.909	2.592
3869.97	1.342	0.0003093	15.039	2.584
3881.99	1.342	0.0003044	14.852	2.576
3894.08	1.342	0.0003050	14.923	2.568
3906.25	1.342	0.0002952	14.492	2.560
4000.00	1.342	0.0004630	23.271	2.500
4100.00	1.342	0.0006334	32.636	2.439
4200.00	1.342	0.0007958	42.000	2.381
4300.00	1.342	0.0006836	36.938	2.326

ISO-PENTANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
4400.00	1.342	0.0005765	31.875	2.273
4500.00	1.342	0.0004741	26.813	2.222
4600.00	1.343	0.0003763	21.750	2.174
4700.00	1.343	0.0002825	16.688	2.128
4800.00	1.343	0.0001927	11.625	2.083
4900.00	1.343	0.0001066	6.563	2.041
5000.00	1.343	0.0000239	1.500	2.000

HEXANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
670.00	1.371	0.0007126	6.000	14.925
680.00	1.372	0.0007022	6.000	14.706
690.00	1.373	0.0011533	10.000	14.493
700.00	1.375	0.0023305	20.500	14.286
714.29	1.380	0.0040457	36.314	14.000
715.10	1.383	0.0051678	46.439	13.984
715.92	1.385	0.0069373	62.412	13.968
716.74	1.385	0.0095303	85.838	13.952
717.57	1.383	0.0103911	93.699	13.936
718.39	1.383	0.0101288	91.438	13.920
719.22	1.385	0.0134065	121.168	13.904
720.05	1.384	0.0168102	152.106	13.888
720.88	1.380	0.0192303	174.204	13.872
721.71	1.378	0.0186418	169.068	13.856
722.54	1.377	0.0188995	171.602	13.840
723.38	1.377	0.0210875	191.691	13.824
724.22	1.371	0.0255147	232.205	13.808
725.06	1.366	0.0200442	182.630	13.792
725.90	1.366	0.0173396	158.171	13.776
726.74	1.366	0.0169864	155.128	13.760
727.59	1.365	0.0173735	158.849	13.744
728.44	1.363	0.0161395	147.739	13.728
729.29	1.362	0.0144454	132.385	13.712
730.14	1.362	0.0126799	116.341	13.696
730.99	1.362	0.0109354	100.452	13.680
731.85	1.363	0.0102047	93.849	13.664
732.71	1.363	0.0097131	89.434	13.648
733.57	1.364	0.0097831	90.184	13.632
734.43	1.363	0.0095639	88.266	13.616
735.29	1.363	0.0089173	82.395	13.600
736.16	1.363	0.0081929	75.791	13.584
737.03	1.364	0.0078911	73.085	13.568
737.90	1.364	0.0083167	77.119	13.552
738.77	1.363	0.0079365	73.679	13.536
739.64	1.363	0.0076360	70.974	13.520
740.52	1.363	0.0071484	66.521	13.504
741.40	1.363	0.0068166	63.508	13.488
742.28	1.363	0.0068925	64.291	13.472
743.16	1.363	0.0064617	60.344	13.456
744.05	1.363	0.0055064	51.485	13.440
744.93	1.363	0.0049075	45.939	13.424
745.82	1.364	0.0047787	44.788	13.408
746.71	1.364	0.0046718	43.837	13.392
747.61	1.364	0.0040817	38.347	13.376
748.50	1.364	0.0031359	29.496	13.360
749.40	1.365	0.0030484	28.708	13.344
750.30	1.366	0.0033359	31.452	13.328
751.20	1.367	0.0034919	32.963	13.312
752.11	1.367	0.0040299	38.088	13.296
753.01	1.367	0.0049484	46.825	13.280
753.92	1.367	0.0054091	51.246	13.264
754.83	1.367	0.0059565	56.500	13.248
755.74	1.367	0.0067754	64.346	13.232

HEXANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
756.66	1.366	0.0076931	73.150	13.216
757.58	1.365	0.0070329	66.953	13.200
758.50	1.364	0.0070021	66.741	13.184
759.42	1.363	0.0068870	65.723	13.168
760.34	1.363	0.0056756	54.229	13.152
761.27	1.363	0.0050429	48.243	13.136
762.20	1.363	0.0046418	44.460	13.120
763.13	1.363	0.0041088	39.402	13.104
764.06	1.363	0.0036516	35.061	13.088
764.99	1.363	0.0025907	24.904	13.072
765.93	1.364	0.0027136	26.118	13.056
766.87	1.364	0.0026748	25.776	13.040
767.81	1.364	0.0019994	19.291	13.024
768.76	1.365	0.0021807	21.067	13.008
769.70	1.365	0.0021656	20.947	12.992
770.65	1.365	0.0020255	19.616	12.976
771.60	1.365	0.0020648	20.021	12.960
772.56	1.365	0.0018019	17.494	12.944
773.51	1.365	0.0015705	15.265	12.928
774.47	1.365	0.0014595	14.205	12.912
775.43	1.366	0.0013510	13.165	12.896
776.40	1.366	0.0012102	11.808	12.880
778.33	1.367	0.0013131	12.843	12.848
779.30	1.367	0.0015848	15.520	12.832
780.27	1.367	0.0018312	17.955	12.816
781.25	1.367	0.0019230	18.879	12.800
782.23	1.368	0.0023959	23.551	12.784
783.21	1.367	0.0027909	27.469	12.768
784.19	1.367	0.0027431	27.032	12.752
785.18	1.367	0.0030944	30.532	12.736
786.16	1.367	0.0031287	30.909	12.720
787.15	1.367	0.0030563	30.232	12.704
788.15	1.367	0.0031687	31.383	12.688
789.14	1.366	0.0030878	30.621	12.672
790.14	1.366	0.0028933	28.729	12.656
791.14	1.366	0.0027924	27.762	12.640
793.15	1.366	0.0023611	23.533	12.608
795.17	1.366	0.0022515	22.498	12.576
796.18	1.366	0.0016647	16.655	12.560
797.19	1.367	0.0014238	14.263	12.544
799.23	1.367	0.0016191	16.261	12.512
800.26	1.368	0.0016088	16.178	12.496
801.28	1.368	0.0023786	23.950	12.480
802.31	1.367	0.0023734	23.928	12.464
803.34	1.368	0.0025246	25.486	12.448
804.38	1.367	0.0028183	28.487	12.432
805.41	1.367	0.0029167	29.520	12.416
806.45	1.367	0.0028766	29.152	12.400
807.49	1.367	0.0029293	29.724	12.384
808.54	1.367	0.0029690	30.166	12.368
809.59	1.366	0.0027274	27.748	12.352
810.64	1.366	0.0025629	26.107	12.336
811.69	1.366	0.0024698	25.192	12.320
812.74	1.367	0.0022278	22.753	12.304
821.29	1.367	0.0023078	23.818	12.176
822.37	1.367	0.0022807	23.569	12.160

HEXANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
823.45	1.366	0.0023167	23.972	12.144
824.54	1.366	0.0021466	22.242	12.128
825.63	1.366	0.0018775	19.479	12.112
826.72	1.366	0.0017624	18.310	12.096
827.81	1.366	0.0015977	16.620	12.080
828.91	1.366	0.0014274	14.868	12.064
830.01	1.366	0.0012494	13.031	12.048
831.12	1.367	0.0012032	12.566	12.032
832.22	1.367	0.0011030	11.536	12.016
833.33	1.367	0.0009871	10.337	12.000
834.45	1.367	0.0009148	9.593	11.984
835.56	1.367	0.0008947	9.394	11.968
836.68	1.367	0.0008605	9.047	11.952
837.80	1.367	0.0007968	8.389	11.936
838.93	1.367	0.0007537	7.945	11.920
840.05	1.367	0.0007662	8.088	11.904
841.18	1.368	0.0007452	7.877	11.888
842.32	1.368	0.0007019	7.430	11.872
843.45	1.368	0.0006932	7.347	11.856
844.59	1.368	0.0007053	7.486	11.840
845.74	1.368	0.0006962	7.399	11.824
846.88	1.368	0.0007068	7.522	11.808
848.03	1.368	0.0007337	7.818	11.792
849.18	1.368	0.0007552	8.058	11.776
850.34	1.369	0.0007609	8.131	11.760
851.50	1.369	0.0007898	8.451	11.744
852.66	1.369	0.0008552	9.163	11.728
853.83	1.369	0.0009421	10.108	11.712
854.99	1.369	0.0010007	10.751	11.696
856.16	1.370	0.0010730	11.544	11.680
857.34	1.370	0.0017743	19.116	11.664
858.52	1.370	0.0020141	21.729	11.648
859.70	1.370	0.0022646	24.465	11.632
860.88	1.369	0.0025459	27.542	11.616
862.07	1.369	0.0025600	27.733	11.600
863.26	1.369	0.0024734	26.831	11.584
864.45	1.369	0.0025973	28.215	11.568
865.65	1.369	0.0024978	27.171	11.552
866.85	1.369	0.0022431	24.435	11.536
868.06	1.369	0.0022989	25.077	11.520
869.26	1.369	0.0022289	24.348	11.504
870.47	1.369	0.0020981	22.950	11.488
871.69	1.369	0.0021551	23.607	11.472
872.91	1.370	0.0022690	24.890	11.456
874.13	1.370	0.0023707	26.042	11.440
875.35	1.370	0.0027806	30.586	11.424
876.58	1.370	0.0032289	35.568	11.408
877.81	1.371	0.0036174	39.903	11.392
879.04	1.371	0.0043088	47.596	11.376
880.28	1.370	0.0051966	57.485	11.360
881.52	1.370	0.0054971	60.894	11.344
882.77	1.369	0.0058795	65.223	11.328
884.02	1.368	0.0062300	69.209	11.312
885.27	1.368	0.0059963	66.706	11.296
886.52	1.367	0.0057025	63.528	11.280
887.78	1.366	0.0055194	61.575	11.264

HEXANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
889.05	1.366	0.0049182	54.947	11.248
890.31	1.366	0.0043730	48.925	11.232
891.58	1.366	0.0040652	45.546	11.216
892.86	1.366	0.0034967	39.233	11.200
894.13	1.366	0.0031589	35.493	11.184
895.42	1.366	0.0030740	34.589	11.168
896.70	1.366	0.0028822	32.478	11.152
897.99	1.367	0.0028753	32.446	11.136
899.28	1.367	0.0030335	34.281	11.120
900.58	1.367	0.0030937	35.011	11.104
901.88	1.367	0.0032260	36.561	11.088
903.18	1.367	0.0034222	38.841	11.072
904.49	1.367	0.0034330	39.020	11.056
905.80	1.366	0.0034312	39.056	11.040
907.11	1.366	0.0034584	39.422	11.024
908.43	1.366	0.0032859	37.511	11.008
909.75	1.366	0.0031321	35.807	10.992
911.08	1.365	0.0028881	33.066	10.976
912.41	1.365	0.0025516	29.255	10.960
913.74	1.365	0.0022842	26.228	10.944
915.08	1.365	0.0017747	20.408	10.928
916.42	1.365	0.0014247	16.407	10.912
917.77	1.366	0.0013152	15.168	10.896
919.12	1.366	0.0011977	13.833	10.880
920.47	1.366	0.0010488	12.131	10.864
921.83	1.366	0.0009719	11.259	10.848
923.19	1.366	0.0009063	10.514	10.832
924.56	1.366	0.0008266	9.604	10.816
925.93	1.366	0.0007498	8.725	10.800
927.30	1.367	0.0007211	8.402	10.784
928.68	1.367	0.0006831	7.972	10.768
930.06	1.367	0.0006448	7.536	10.752
931.45	1.367	0.0006261	7.329	10.736
932.84	1.367	0.0006153	7.213	10.720
934.23	1.367	0.0006017	7.064	10.704
935.63	1.367	0.0005845	6.872	10.688
937.03	1.367	0.0005767	6.791	10.672
938.44	1.367	0.0005790	6.828	10.656
939.85	1.368	0.0005910	6.980	10.640
941.27	1.368	0.0006097	7.212	10.624
942.68	1.368	0.0006312	7.477	10.608
944.11	1.368	0.0006541	7.761	10.592
945.54	1.368	0.0006933	8.238	10.576
946.97	1.368	0.0007382	8.785	10.560
948.41	1.368	0.0007437	8.863	10.544
949.85	1.368	0.0007516	8.971	10.528
951.29	1.368	0.0007649	9.144	10.512
952.74	1.368	0.0007974	9.547	10.496
954.20	1.368	0.0007998	9.591	10.480
955.66	1.368	0.0007868	9.449	10.464
957.12	1.368	0.0008212	9.877	10.448
958.59	1.368	0.0008647	10.417	10.432
960.06	1.369	0.0008973	10.825	10.416
961.54	1.369	0.0010464	12.644	10.400
963.02	1.369	0.0010959	13.262	10.384
964.51	1.369	0.0012031	14.582	10.368

HEXANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
966.00	1.369	0.0014881	18.064	10.352
967.49	1.369	0.0015742	19.139	10.336
968.99	1.369	0.0016398	19.967	10.320
970.50	1.368	0.0018357	22.387	10.304
972.01	1.368	0.0016732	20.438	10.288
973.52	1.368	0.0013822	16.910	10.272
975.04	1.368	0.0013722	16.814	10.256
976.56	1.368	0.0012791	15.697	10.240
978.09	1.368	0.0010936	13.441	10.224
979.62	1.369	0.0010571	13.013	10.208
981.16	1.369	0.0011259	13.882	10.192
984.25	1.369	0.0018804	23.258	10.160
985.80	1.369	0.0019651	24.344	10.144
987.36	1.369	0.0019955	24.760	10.128
988.92	1.368	0.0021384	26.574	10.112
990.49	1.368	0.0017673	21.997	10.096
992.06	1.368	0.0015074	18.792	10.080
993.64	1.368	0.0016320	20.378	10.064
995.22	1.368	0.0013606	17.016	10.048
996.81	1.369	0.0011905	14.913	10.032
998.40	1.369	0.0014898	18.691	10.016
1000.00	1.369	0.0015330	19.264	10.000
1001.60	1.369	0.0013595	17.111	9.984
1003.21	1.370	0.0018569	23.410	9.968
1004.82	1.370	0.0024403	30.813	9.952
1006.44	1.369	0.0024196	30.601	9.936
1008.06	1.369	0.0028665	36.312	9.920
1009.69	1.369	0.0034099	43.265	9.904
1011.33	1.368	0.0032241	40.975	9.888
1012.97	1.368	0.0029017	36.936	9.872
1014.61	1.367	0.0026172	33.369	9.856
1016.26	1.367	0.0020173	25.763	9.840
1017.92	1.367	0.0014293	18.283	9.824
1019.58	1.368	0.0011296	14.473	9.808
1021.24	1.368	0.0008799	11.293	9.792
1022.91	1.369	0.0007688	9.883	9.776
1024.59	1.369	0.0009599	12.359	9.760
1026.27	1.369	0.0011000	14.186	9.744
1027.96	1.370	0.0015296	19.759	9.728
1029.65	1.370	0.0022805	29.507	9.712
1031.35	1.370	0.0026725	34.636	9.696
1033.06	1.370	0.0030754	39.924	9.680
1034.77	1.369	0.0034760	45.199	9.664
1036.48	1.368	0.0031182	40.614	9.648
1038.21	1.368	0.0029360	38.305	9.632
1039.93	1.368	0.0027434	35.851	9.616
1041.67	1.368	0.0020548	26.897	9.600
1043.41	1.368	0.0017983	23.579	9.584
1045.15	1.368	0.0013698	17.991	9.568
1046.90	1.369	0.0012973	17.067	9.552
1048.66	1.369	0.0015253	20.100	9.536
1050.42	1.370	0.0018655	24.624	9.520
1052.19	1.370	0.0025687	33.964	9.504
1053.96	1.370	0.0033235	44.018	9.488
1055.74	1.369	0.0034907	46.310	9.472
1057.53	1.369	0.0038879	51.667	9.456

HEXANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
1059.32	1.369	0.0045063	59.987	9.440
1061.12	1.368	0.0047116	62.827	9.424
1062.93	1.367	0.0047470	63.406	9.408
1064.74	1.366	0.0040113	53.671	9.392
1066.55	1.366	0.0031508	42.229	9.376
1068.38	1.366	0.0019167	25.734	9.360
1072.04	1.367	0.0016578	22.333	9.328
1073.88	1.367	0.0013732	18.531	9.312
1075.73	1.367	0.0012737	17.218	9.296
1077.59	1.367	0.0012000	16.250	9.280
1079.45	1.367	0.0010589	14.364	9.264
1081.31	1.367	0.0009110	12.379	9.248
1083.19	1.367	0.0008293	11.288	9.232
1085.07	1.368	0.0007819	10.661	9.216
1086.96	1.368	0.0006860	9.370	9.200
1088.85	1.368	0.0006249	8.550	9.184
1090.75	1.368	0.0005997	8.219	9.168
1092.66	1.368	0.0005791	7.951	9.152
1094.57	1.368	0.0005466	7.518	9.136
1096.49	1.368	0.0004980	6.862	9.120
1098.42	1.368	0.0004591	6.337	9.104
1100.35	1.369	0.0004612	6.378	9.088
1102.29	1.369	0.0004818	6.674	9.072
1104.24	1.369	0.0005184	7.193	9.056
1106.19	1.369	0.0005093	7.080	9.040
1108.16	1.369	0.0004997	6.959	9.024
1110.12	1.369	0.0005118	7.139	9.008
1112.10	1.369	0.0005775	8.071	8.992
1114.08	1.369	0.0007024	9.833	8.976
1116.07	1.370	0.0007261	10.183	8.960
1118.07	1.370	0.0007681	10.792	8.944
1120.07	1.370	0.0009319	13.116	8.928
1122.08	1.370	0.0011097	15.648	8.912
1124.10	1.370	0.0013809	19.507	8.896
1126.13	1.370	0.0017322	24.512	8.880
1128.16	1.370	0.0022810	32.337	8.864
1130.20	1.370	0.0024992	35.494	8.848
1132.25	1.370	0.0032156	45.752	8.832
1134.30	1.369	0.0035356	50.397	8.816
1136.36	1.368	0.0031389	44.824	8.800
1138.43	1.368	0.0026374	37.730	8.784
1140.51	1.368	0.0020553	29.456	8.768
1142.60	1.368	0.0012939	18.578	8.752
1144.69	1.368	0.0012652	18.199	8.736
1146.79	1.368	0.0011729	16.903	8.720
1148.90	1.368	0.0010532	15.205	8.704
1151.01	1.369	0.0009452	13.671	8.688
1153.14	1.369	0.0008441	12.232	8.672
1155.27	1.369	0.0008255	11.985	8.656
1157.41	1.369	0.0008110	11.796	8.640
1159.55	1.369	0.0008176	11.913	8.624
1161.71	1.369	0.0007979	11.647	8.608
1163.87	1.369	0.0007418	10.849	8.592
1166.04	1.369	0.0007044	10.322	8.576
1168.22	1.369	0.0006858	10.067	8.560
1170.41	1.369	0.0006646	9.776	8.544

HEXANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
1172.61	1.369	0.0006023	8.875	8.528
1174.81	1.370	0.0005475	8.083	8.512
1177.02	1.370	0.0005288	7.821	8.496
1179.25	1.370	0.0005143	7.621	8.480
1181.47	1.370	0.0005213	7.740	8.464
1183.71	1.370	0.0005299	7.882	8.448
1185.96	1.370	0.0005325	7.936	8.432
1188.21	1.370	0.0005275	7.876	8.416
1190.48	1.370	0.0005364	8.025	8.400
1192.75	1.371	0.0005578	8.360	8.384
1195.03	1.371	0.0006013	9.029	8.368
1197.32	1.371	0.0006565	9.878	8.352
1199.62	1.371	0.0006910	10.417	8.336
1201.92	1.371	0.0008209	12.399	8.320
1204.24	1.371	0.0008860	13.407	8.304
1206.56	1.371	0.0009961	15.103	8.288
1208.90	1.372	0.0011682	17.747	8.272
1211.24	1.371	0.0018514	28.179	8.256
1213.59	1.371	0.0018628	28.408	8.240
1215.95	1.371	0.0016829	25.715	8.224
1218.32	1.370	0.0012455	19.068	8.208
1220.70	1.371	0.0008578	13.158	8.192
1223.09	1.371	0.0006646	10.214	8.176
1225.49	1.371	0.0004905	7.554	8.160
1227.90	1.372	0.0006416	9.900	8.144
1230.31	1.372	0.0007957	12.302	8.128
1232.74	1.372	0.0011398	17.656	8.112
1235.18	1.372	0.0015674	24.329	8.096
1237.62	1.372	0.0019483	30.301	8.080
1240.08	1.372	0.0022039	34.344	8.064
1242.54	1.372	0.0023167	36.173	8.048
1245.02	1.371	0.0020026	31.331	8.032
1247.50	1.371	0.0012562	19.693	8.016
1250.00	1.371	0.0008359	13.130	8.000
1252.51	1.372	0.0005019	7.899	7.984
1255.02	1.373	0.0006204	9.784	7.968
1257.55	1.373	0.0010401	16.437	7.952
1260.08	1.373	0.0014109	22.341	7.936
1262.63	1.373	0.0016038	25.447	7.920
1265.18	1.373	0.0015277	24.288	7.904
1267.75	1.373	0.0012346	19.669	7.888
1270.33	1.373	0.0010266	16.389	7.872
1272.91	1.374	0.0009121	14.589	7.856
1275.51	1.374	0.0010289	16.492	7.840
1278.12	1.375	0.0015801	25.379	7.824
1280.74	1.375	0.0023219	37.370	7.808
1283.37	1.375	0.0029312	47.272	7.792
1286.01	1.375	0.0035525	57.411	7.776
1288.66	1.374	0.0037682	61.022	7.760
1291.32	1.374	0.0032761	53.161	7.744
1294.00	1.374	0.0027658	44.975	7.728
1296.68	1.374	0.0024084	39.244	7.712
1299.38	1.374	0.0021617	35.297	7.696
1302.08	1.375	0.0021984	35.970	7.680
1304.80	1.375	0.0023189	38.022	7.664
1307.53	1.375	0.0022689	37.280	7.648

HEXANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
1310.27	1.375	0.0023306	38.373	7.632
1313.03	1.376	0.0023374	38.566	7.616
1315.79	1.376	0.0021578	35.678	7.600
1318.57	1.376	0.0019344	32.053	7.584
1321.35	1.377	0.0016262	27.003	7.568
1324.15	1.378	0.0016291	27.108	7.552
1326.96	1.379	0.0020361	33.952	7.536
1329.79	1.380	0.0025677	42.908	7.520
1332.62	1.381	0.0034298	57.435	7.504
1335.47	1.383	0.0044365	74.454	7.488
1349.89	1.383	0.0133436	226.351	7.408
1352.81	1.382	0.0137683	234.060	7.392
1355.75	1.382	0.0160003	272.595	7.376
1358.70	1.380	0.0174628	298.159	7.360
1361.66	1.377	0.0174439	298.485	7.344
1364.63	1.377	0.0157195	269.566	7.328
1367.61	1.377	0.0163233	280.531	7.312
1370.61	1.377	0.0163160	281.020	7.296
1373.63	1.377	0.0168333	290.570	7.280
1376.65	1.376	0.0187872	325.010	7.264
1379.69	1.374	0.0200793	348.130	7.248
1382.74	1.372	0.0187189	325.260	7.232
1385.81	1.371	0.0172649	300.661	7.216
1388.89	1.371	0.0170425	297.448	7.200
1391.98	1.371	0.0170530	298.293	7.184
1395.09	1.371	0.0171308	300.324	7.168
1398.21	1.370	0.0181085	318.175	7.152
1401.35	1.368	0.0176251	310.377	7.136
1404.49	1.367	0.0158759	280.200	7.120
1407.66	1.367	0.0134045	237.115	7.104
1410.84	1.369	0.0121265	214.993	7.088
1414.03	1.371	0.0123445	219.352	7.072
1417.23	1.371	0.0129176	230.055	7.056
1420.45	1.372	0.0123522	220.486	7.040
1423.69	1.374	0.0112342	200.986	7.024
1426.94	1.377	0.0135558	243.076	7.008
1430.21	1.378	0.0149806	269.239	6.992
1433.49	1.380	0.0180602	325.333	6.976
1436.78	1.381	0.0209882	378.945	6.960
1440.09	1.381	0.0253258	458.313	6.944
1443.42	1.381	0.0293147	531.726	6.928
1446.76	1.379	0.0347823	632.361	6.912
1450.12	1.376	0.0397589	724.516	6.896
1453.49	1.370	0.0462671	845.073	6.880
1456.88	1.360	0.0500093	915.555	6.864
1460.28	1.349	0.0476155	873.765	6.848
1463.70	1.339	0.0415944	765.062	6.832
1467.14	1.333	0.0322226	594.075	6.816
1470.59	1.332	0.0215975	399.122	6.800
1474.06	1.335	0.0152603	282.676	6.784
1477.54	1.338	0.0125297	232.643	6.768
1481.04	1.340	0.0086119	160.278	6.752
1484.56	1.343	0.0069663	129.959	6.736
1488.10	1.344	0.0061177	114.400	6.720
1491.65	1.345	0.0039792	74.589	6.704
1495.22	1.347	0.0031691	59.546	6.688

HEXANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
1498.80	1.349	0.0025157	47.381	6.672
1502.40	1.350	0.0020273	38.275	6.656
1506.02	1.351	0.0019100	36.147	6.640
1509.66	1.352	0.0019929	37.808	6.624
1513.32	1.353	0.0018773	35.701	6.608
1516.99	1.353	0.0016439	31.338	6.592
1520.68	1.354	0.0013006	24.853	6.576
1535.63	1.356	0.0011754	22.681	6.512
1539.41	1.357	0.0010913	21.110	6.496
1543.21	1.357	0.0010154	19.690	6.480
1547.03	1.357	0.0009521	18.510	6.464
1550.87	1.358	0.0008857	17.261	6.448
1554.73	1.358	0.0008516	16.638	6.432
1558.60	1.358	0.0007755	15.190	6.416
1562.50	1.358	0.0007389	14.508	6.400
1566.42	1.359	0.0007089	13.954	6.384
1570.35	1.359	0.0006785	13.389	6.368
1574.31	1.359	0.0006470	12.801	6.352
1578.28	1.359	0.0006228	12.351	6.336
1582.28	1.360	0.0005900	11.731	6.320
1586.29	1.360	0.0005731	11.424	6.304
1590.33	1.360	0.0005524	11.039	6.288
1594.39	1.360	0.0005510	11.039	6.272
1598.47	1.360	0.0005530	11.109	6.256
1602.56	1.360	0.0005597	11.271	6.240
1606.68	1.361	0.0005617	11.341	6.224
1610.82	1.361	0.0005574	11.284	6.208
1614.99	1.361	0.0005277	10.710	6.192
1619.17	1.361	0.0004945	10.062	6.176
1623.38	1.361	0.0004613	9.410	6.160
1627.60	1.361	0.0004412	9.023	6.144
1631.85	1.361	0.0004404	9.030	6.128
1636.13	1.361	0.0004237	8.712	6.112
1640.42	1.362	0.0004156	8.568	6.096
1644.74	1.362	0.0003994	8.254	6.080
1649.08	1.362	0.0003940	8.164	6.064
1653.44	1.362	0.0003947	8.202	6.048
1657.82	1.362	0.0004038	8.413	6.032
1662.23	1.362	0.0004099	8.562	6.016
1675.60	1.362	0.0004087	8.605	5.968
1680.11	1.362	0.0004138	8.737	5.952
1684.64	1.362	0.0004144	8.772	5.936
1689.19	1.363	0.0003991	8.471	5.920
1693.77	1.363	0.0003567	7.592	5.904
1698.37	1.363	0.0003321	7.087	5.888
1703.00	1.363	0.0002993	6.406	5.872
1707.65	1.363	0.0002664	5.717	5.856
1712.33	1.363	0.0002373	5.107	5.840
1717.03	1.363	0.0002291	4.944	5.824
1721.76	1.363	0.0002209	4.779	5.808
1726.52	1.363	0.0002109	4.575	5.792
1731.30	1.363	0.0001906	4.147	5.776
1736.11	1.363	0.0001841	4.017	5.760
1740.95	1.363	0.0001659	3.630	5.744
1745.81	1.363	0.0001550	3.400	5.728
1750.70	1.363	0.0001474	3.242	5.712

HEXANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
1755.62	1.364	0.0001592	3.513	5.696
1760.56	1.364	0.0001800	3.983	5.680
1765.54	1.364	0.0001868	4.144	5.664
1770.54	1.364	0.0001861	4.140	5.648
1775.57	1.364	0.0001731	3.861	5.632
1780.63	1.364	0.0001600	3.579	5.616
1785.71	1.364	0.0001435	3.221	5.600
1790.83	1.364	0.0001256	2.827	5.584
1795.98	1.364	0.0001090	2.461	5.568
1801.15	1.364	0.0001005	2.274	5.552
1806.36	1.364	0.0000949	2.154	5.536
1811.59	1.364	0.0000848	1.931	5.520
1816.86	1.364	0.0000803	1.832	5.504
1822.16	1.364	0.0000745	1.706	5.488
1827.49	1.364	0.0000739	1.696	5.472
1832.84	1.364	0.0000797	1.835	5.456
1838.24	1.364	0.0000896	2.070	5.440
1843.66	1.364	0.0000903	2.093	5.424
1849.11	1.365	0.0000906	2.104	5.408
1851.85	1.365	0.0000866	2.014	5.400
1854.60	1.365	0.0000896	2.089	5.392
1857.36	1.365	0.0000888	2.072	5.384
1860.12	1.365	0.0000869	2.031	5.376
1862.89	1.365	0.0000840	1.967	5.368
1865.67	1.365	0.0000890	2.087	5.360
1868.46	1.365	0.0000943	2.214	5.352
1871.26	1.365	0.0001011	2.377	5.344
1874.06	1.365	0.0001060	2.496	5.336
1876.88	1.365	0.0001166	2.750	5.328
1879.70	1.365	0.0001298	3.065	5.320
1882.53	1.365	0.0001486	3.516	5.312
1885.37	1.365	0.0001633	3.869	5.304
1888.22	1.365	0.0001716	4.071	5.296
1891.07	1.365	0.0001712	4.068	5.288
1893.94	1.365	0.0001635	3.891	5.280
1896.81	1.365	0.0001541	3.673	5.272
1899.70	1.365	0.0001452	3.466	5.264
1902.59	1.365	0.0001345	3.216	5.256
1905.49	1.365	0.0001205	2.885	5.248
1908.40	1.365	0.0001102	2.643	5.240
1911.31	1.365	0.0001001	2.404	5.232
1914.24	1.365	0.0000971	2.335	5.224
1917.18	1.365	0.0000916	2.206	5.216
1920.12	1.365	0.0000880	2.122	5.208
1923.08	1.365	0.0000866	2.093	5.200
1926.04	1.365	0.0000852	2.063	5.192
1929.01	1.365	0.0000867	2.101	5.184
1931.99	1.365	0.0000871	2.114	5.176
1934.98	1.365	0.0000863	2.098	5.168
1937.98	1.365	0.0000879	2.140	5.160
1940.99	1.365	0.0000897	2.187	5.152
1944.01	1.365	0.0000937	2.290	5.144
1947.04	1.365	0.0000954	2.333	5.136
1950.08	1.365	0.0000927	2.272	5.128
1953.13	1.365	0.0000886	2.176	5.120
1956.18	1.365	0.0000836	2.055	5.112

HEXANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
1959.25	1.365	0.0000802	1.975	5.104
1962.32	1.365	0.0000776	1.915	5.096
1965.41	1.365	0.0000739	1.826	5.088
1968.50	1.365	0.0000721	1.784	5.080
1971.61	1.365	0.0000721	1.786	5.072
1974.72	1.365	0.0000736	1.825	5.064
1977.85	1.366	0.0000735	1.827	5.056
1980.98	1.366	0.0000736	1.833	5.048
1984.13	1.366	0.0000746	1.860	5.040
1987.28	1.366	0.0000774	1.933	5.032
1990.45	1.366	0.0000806	2.017	5.024
1993.62	1.366	0.0000876	2.195	5.016
1996.81	1.366	0.0000946	2.374	5.008
2000.00	1.366	0.0001040	2.615	5.000
2003.21	1.366	0.0001177	2.962	4.992
2006.42	1.366	0.0001328	3.348	4.984
2009.65	1.366	0.0001536	3.879	4.976
2012.88	1.366	0.0001747	4.420	4.968
2016.13	1.366	0.0001943	4.921	4.960
2019.39	1.366	0.0002092	5.309	4.952
2022.65	1.366	0.0002174	5.526	4.944
2025.93	1.366	0.0002180	5.549	4.936
2029.22	1.366	0.0002166	5.523	4.928
2032.52	1.366	0.0002116	5.404	4.920
2035.83	1.366	0.0002024	5.179	4.912
2039.15	1.366	0.0001933	4.953	4.904
2042.48	1.366	0.0001832	4.702	4.896
2045.83	1.366	0.0001725	4.434	4.888
2049.18	1.366	0.0001627	4.190	4.880
2052.55	1.366	0.0001507	3.888	4.872
2055.92	1.366	0.0001396	3.608	4.864
2059.31	1.366	0.0001294	3.349	4.856
2062.71	1.366	0.0001203	3.118	4.848
2066.12	1.366	0.0001147	2.978	4.840
2069.54	1.366	0.0001096	2.849	4.832
2072.97	1.366	0.0001053	2.743	4.824
2076.41	1.366	0.0001018	2.657	4.816
2079.87	1.366	0.0000977	2.554	4.808
2083.33	1.366	0.0000966	2.528	4.800
2086.81	1.366	0.0000963	2.526	4.792
2090.30	1.366	0.0000997	2.619	4.784
2093.80	1.366	0.0001019	2.680	4.776
2097.32	1.366	0.0001054	2.778	4.768
2100.84	1.366	0.0001086	2.868	4.760
2104.38	1.366	0.0001115	2.949	4.752
2107.93	1.366	0.0001163	3.080	4.744
2111.49	1.366	0.0001182	3.136	4.736
2115.06	1.366	0.0001215	3.228	4.728
2118.64	1.366	0.0001269	3.379	4.720
2122.24	1.366	0.0001334	3.558	4.712
2125.85	1.366	0.0001400	3.741	4.704
2129.47	1.367	0.0001450	3.881	4.696
2133.11	1.367	0.0001518	4.068	4.688
2136.75	1.367	0.0001609	4.320	4.680
2140.41	1.367	0.0001702	4.577	4.672
2144.08	1.367	0.0001785	4.810	4.664

HEXANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
2147.77	1.367	0.0001846	4.984	4.656
2151.46	1.367	0.0001949	5.270	4.648
2155.17	1.367	0.0002052	5.558	4.640
2158.89	1.367	0.0002145	5.820	4.632
2162.63	1.367	0.0002228	6.054	4.624
2166.38	1.367	0.0002309	6.286	4.616
2170.14	1.367	0.0002411	6.575	4.608
2173.91	1.367	0.0002489	6.800	4.600
2177.70	1.367	0.0002557	6.997	4.592
2181.50	1.367	0.0002579	7.070	4.584
2185.31	1.367	0.0002574	7.069	4.576
2189.14	1.367	0.0002576	7.086	4.568
2192.98	1.367	0.0002516	6.934	4.560
2196.84	1.367	0.0002453	6.773	4.552
2200.70	1.367	0.0002343	6.480	4.544
2204.59	1.367	0.0002240	6.205	4.536
2208.48	1.367	0.0002145	5.952	4.528
2212.39	1.367	0.0002064	5.738	4.520
2216.31	1.367	0.0001995	5.556	4.512
2220.25	1.367	0.0001960	5.468	4.504
2224.20	1.367	0.0001967	5.498	4.496
2228.16	1.367	0.0002011	5.632	4.488
2232.14	1.367	0.0002075	5.820	4.480
2236.14	1.367	0.0002179	6.122	4.472
2240.14	1.367	0.0002291	6.449	4.464
2244.17	1.367	0.0002387	6.732	4.456
2248.20	1.367	0.0002418	6.832	4.448
2252.25	1.367	0.0002459	6.959	4.440
2256.32	1.367	0.0002478	7.025	4.432
2260.40	1.367	0.0002472	7.023	4.424
2264.49	1.367	0.0002428	6.910	4.416
2268.60	1.367	0.0002357	6.719	4.408
2272.73	1.367	0.0002271	6.487	4.400
2276.87	1.367	0.0002220	6.352	4.392
2281.02	1.367	0.0002193	6.285	4.384
2285.19	1.368	0.0002162	6.209	4.376
2289.38	1.368	0.0002173	6.251	4.368
2293.58	1.368	0.0002267	6.535	4.360
2297.79	1.368	0.0002311	6.672	4.352
2302.03	1.368	0.0002397	6.935	4.344
2306.27	1.368	0.0002555	7.403	4.336
2310.54	1.368	0.0002662	7.729	4.328
2314.81	1.368	0.0002742	7.977	4.320
2319.11	1.368	0.0002867	8.356	4.312
2323.42	1.368	0.0002965	8.656	4.304
2327.75	1.368	0.0003119	9.124	4.296
2332.09	1.368	0.0003343	9.796	4.288
2336.45	1.368	0.0003592	10.547	4.280
2340.82	1.368	0.0003677	10.816	4.272
2345.22	1.368	0.0003753	11.061	4.264
2349.62	1.368	0.0003845	11.352	4.256
2354.05	1.368	0.0003848	11.383	4.248
2358.49	1.368	0.0003806	11.281	4.240
2362.95	1.368	0.0003764	11.176	4.232
2367.42	1.368	0.0003567	10.613	4.224
2371.92	1.368	0.0003372	10.051	4.216

HEXANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
2376.43	1.368	0.0003278	9.791	4.208
2380.95	1.368	0.0003081	9.220	4.200
2385.50	1.368	0.0002989	8.960	4.192
2390.06	1.368	0.0002907	8.731	4.184
2394.64	1.368	0.0002828	8.509	4.176
2399.23	1.368	0.0002787	8.403	4.168
2403.85	1.368	0.0002775	8.383	4.160
2408.48	1.369	0.0002743	8.301	4.152
2413.13	1.369	0.0002664	8.077	4.144
2417.79	1.369	0.0002555	7.763	4.136
2422.48	1.369	0.0002450	7.458	4.128
2427.18	1.369	0.0002344	7.149	4.120
2431.91	1.369	0.0002219	6.783	4.112
2436.65	1.369	0.0002121	6.493	4.104
2441.41	1.369	0.0002036	6.248	4.096
2446.18	1.369	0.0001990	6.117	4.088
2450.98	1.369	0.0001960	6.038	4.080
2455.80	1.369	0.0001961	6.053	4.072
2460.63	1.369	0.0001985	6.137	4.064
2465.48	1.369	0.0002020	6.260	4.056
2470.36	1.369	0.0002066	6.414	4.048
2475.25	1.369	0.0002135	6.642	4.040
2480.16	1.370	0.0002242	6.988	4.032
2485.09	1.370	0.0002344	7.319	4.024
2490.04	1.370	0.0002425	7.589	4.016
2495.01	1.370	0.0002479	7.774	4.008
2500.00	1.370	0.0002531	7.951	4.000
2505.01	1.370	0.0002574	8.103	3.992
2510.04	1.370	0.0002635	8.312	3.984
2515.09	1.370	0.0002700	8.535	3.976
2520.16	1.370	0.0002774	8.784	3.968
2525.25	1.370	0.0002872	9.112	3.960
2530.36	1.370	0.0003028	9.628	3.952
2535.50	1.371	0.0003329	10.607	3.944
2540.65	1.371	0.0003398	10.850	3.936
2545.82	1.371	0.0003615	11.565	3.928
2551.02	1.371	0.0003913	12.545	3.920
2556.24	1.371	0.0004378	14.062	3.912
2561.48	1.371	0.0004964	15.979	3.904
2566.74	1.371	0.0005553	17.911	3.896
2572.02	1.371	0.0005745	18.570	3.888
2577.32	1.372	0.0006432	20.832	3.880
2582.64	1.372	0.0006996	22.704	3.872
2587.99	1.372	0.0007540	24.522	3.864
2593.36	1.372	0.0008004	26.085	3.856
2598.75	1.372	0.0008274	27.021	3.848
2604.17	1.372	0.0008413	27.532	3.840
2609.60	1.372	0.0008416	27.599	3.832
2615.06	1.372	0.0008594	28.243	3.824
2620.55	1.373	0.0008726	28.736	3.816
2626.05	1.373	0.0008982	29.641	3.808
2631.58	1.373	0.0009318	30.812	3.800
2637.13	1.373	0.0009795	32.460	3.792
2642.71	1.373	0.0010378	34.465	3.784
2648.31	1.373	0.0010980	36.541	3.776
2653.93	1.374	0.0011550	38.519	3.768

HEXANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
2659.57	1.374	0.0011849	39.599	3.760
2665.25	1.374	0.0011920	39.924	3.752
2670.94	1.374	0.0011906	39.962	3.744
2676.66	1.374	0.0011700	39.355	3.736
2682.40	1.375	0.0011280	38.024	3.728
2688.17	1.375	0.0011146	37.653	3.720
2693.97	1.375	0.0011446	38.748	3.712
2699.78	1.376	0.0012027	40.804	3.704
2705.63	1.376	0.0012578	42.766	3.696
2711.50	1.376	0.0013499	45.997	3.688
2717.39	1.377	0.0014139	48.281	3.680
2723.31	1.377	0.0014579	49.891	3.672
2729.26	1.378	0.0014732	50.524	3.664
2735.23	1.378	0.0014801	50.875	3.656
2741.23	1.379	0.0014941	51.467	3.648
2747.25	1.379	0.0015268	52.711	3.640
2753.30	1.380	0.0015802	54.673	3.632
2759.38	1.381	0.0016415	56.921	3.624
2765.49	1.382	0.0017669	61.403	3.616
2771.62	1.383	0.0019466	67.797	3.608
2777.78	1.385	0.0022141	77.288	3.600
2783.96	1.387	0.0027522	96.285	3.592
2790.18	1.389	0.0031293	109.721	3.584
2796.42	1.391	0.0069437	244.009	3.576
2802.69	1.392	0.0082050	288.978	3.568
2808.99	1.393	0.0097518	344.225	3.560
2815.32	1.395	0.0119780	423.762	3.552
2821.67	1.397	0.0147323	522.381	3.544
2828.05	1.398	0.0181490	644.986	3.536
2834.47	1.399	0.0225236	802.268	3.528
2840.91	1.398	0.0270242	964.761	3.520
2847.38	1.397	0.0313803	1122.825	3.512
2853.88	1.395	0.0359024	1287.565	3.504
2860.41	1.392	0.0406157	1459.932	3.496
2866.97	1.387	0.0419774	1512.336	3.488
2873.56	1.382	0.0431947	1559.771	3.480
2880.18	1.379	0.0408783	1479.526	3.472
2886.84	1.380	0.0408292	1481.166	3.464
2893.52	1.380	0.0436864	1588.484	3.456
2900.23	1.379	0.0469433	1710.864	3.448
2906.98	1.378	0.0509979	1862.963	3.440
2913.75	1.374	0.0583956	2138.169	3.432
2920.56	1.365	0.0654718	2402.870	3.424
2927.40	1.352	0.0659278	2425.274	3.416
2934.27	1.338	0.0644842	2377.733	3.408
2941.18	1.324	0.0542465	2004.949	3.400
2948.11	1.318	0.0365044	1352.380	3.392
2955.08	1.321	0.0272566	1012.162	3.384
2962.09	1.323	0.0195002	725.850	3.376
2969.12	1.326	0.0143430	535.154	3.368
2976.19	1.329	0.0097532	364.768	3.360
2983.29	1.333	0.0064370	241.318	3.352
2990.43	1.336	0.0051121	192.107	3.344
2997.60	1.339	0.0041298	155.567	3.336
3004.81	1.341	0.0035347	133.468	3.328
3012.05	1.343	0.0030029	113.662	3.320

HEXANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
3019.32	1.344	0.0025046	95.028	3.312
3026.63	1.345	0.0021135	80.384	3.304
3033.98	1.347	0.0018060	68.857	3.296
3041.36	1.348	0.0015484	59.179	3.288
3048.78	1.349	0.0014168	54.280	3.280
3056.23	1.349	0.0012501	48.013	3.272
3063.73	1.350	0.0011069	42.617	3.264
3071.25	1.351	0.0009947	38.389	3.256
3078.82	1.351	0.0008924	34.527	3.248
3086.42	1.352	0.0008171	31.692	3.240
3094.06	1.353	0.0007527	29.265	3.232
3101.74	1.353	0.0007034	27.416	3.224
3109.45	1.354	0.0006721	26.261	3.216
3117.21	1.354	0.0006434	25.204	3.208
3125.00	1.354	0.0006175	24.251	3.200
3132.83	1.355	0.0006061	23.860	3.192
3140.70	1.355	0.0005946	23.468	3.184
3148.61	1.355	0.0005781	22.874	3.176
3156.57	1.356	0.0005715	22.668	3.168
3164.56	1.356	0.0005579	22.185	3.160
3172.59	1.356	0.0005302	21.140	3.152
3180.66	1.356	0.0004939	19.740	3.144
3188.78	1.357	0.0004530	18.154	3.136
3196.93	1.357	0.0004466	17.943	3.128
3205.13	1.357	0.0003887	15.654	3.120
3213.37	1.357	0.0003361	13.572	3.112
3221.65	1.357	0.0002919	11.818	3.104
3229.97	1.358	0.0002556	10.376	3.096
3238.34	1.358	0.0002249	9.152	3.088
3246.75	1.358	0.0002003	8.172	3.080
3255.21	1.358	0.0001816	7.429	3.072
3263.71	1.358	0.0001630	6.684	3.064
3272.25	1.358	0.0001508	6.202	3.056
3280.84	1.359	0.0001412	5.822	3.048
3289.47	1.359	0.0001323	5.468	3.040
3298.15	1.359	0.0001248	5.171	3.032
3306.88	1.359	0.0001208	5.022	3.024
3315.65	1.359	0.0001197	4.985	3.016
3324.47	1.359	0.0001183	4.943	3.008
3333.33	1.359	0.0001177	4.930	3.000
3342.25	1.360	0.0001178	4.949	2.992
3351.21	1.360	0.0001182	4.978	2.984
3360.22	1.360	0.0001171	4.945	2.976
3369.27	1.360	0.0001135	4.807	2.968
3378.38	1.360	0.0001097	4.659	2.960
3387.53	1.360	0.0001048	4.463	2.952
3396.74	1.360	0.0001004	4.284	2.944
3405.99	1.360	0.0000934	3.996	2.936
3415.30	1.360	0.0000857	3.678	2.928
3424.66	1.360	0.0000768	3.306	2.920
3434.07	1.360	0.0000677	2.921	2.912
3443.53	1.361	0.0000600	2.597	2.904
3453.04	1.361	0.0000545	2.364	2.896
3462.60	1.361	0.0000494	2.151	2.888
3472.22	1.361	0.0000423	1.845	2.880
3481.89	1.361	0.0000379	1.657	2.872

HEXANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
3491.62	1.361	0.0000354	1.554	2.864
3501.40	1.361	0.0000351	1.544	2.856
3511.24	1.361	0.0000355	1.568	2.848
3521.13	1.361	0.0000364	1.612	2.840
3531.07	1.361	0.0000413	1.834	2.832
3541.08	1.361	0.0000504	2.242	2.824
3551.14	1.361	0.0000589	2.626	2.816
3561.25	1.362	0.0000705	3.153	2.808
3571.43	1.362	0.0000840	3.769	2.800
3581.66	1.362	0.0001005	4.522	2.792
3591.95	1.362	0.0001182	5.336	2.784
3602.31	1.362	0.0001338	6.056	2.776
3612.72	1.362	0.0001473	6.689	2.768
3623.19	1.362	0.0001551	7.063	2.760
3633.72	1.362	0.0001611	7.354	2.752
3644.31	1.362	0.0001624	7.438	2.744
3654.97	1.362	0.0001598	7.342	2.736
3665.69	1.362	0.0001580	7.278	2.728
3676.47	1.362	0.0001560	7.206	2.720
3687.32	1.362	0.0001553	7.196	2.712
3698.22	1.362	0.0001554	7.220	2.704
3709.20	1.362	0.0001575	7.340	2.696
3720.24	1.362	0.0001632	7.631	2.688
3731.34	1.362	0.0001678	7.868	2.680
3742.51	1.362	0.0001715	8.065	2.672
3753.75	1.362	0.0001742	8.215	2.664
3765.06	1.362	0.0001755	8.302	2.656
3776.44	1.362	0.0001754	8.323	2.648
3787.88	1.362	0.0001728	8.226	2.640
3799.39	1.363	0.0001709	8.160	2.632
3810.98	1.363	0.0001692	8.101	2.624
3822.63	1.363	0.0001693	8.134	2.616
3834.36	1.363	0.0001634	7.872	2.608
3846.15	1.363	0.0001639	7.922	2.600
3858.02	1.363	0.0001683	8.162	2.592
3869.97	1.363	0.0001744	8.481	2.584
3881.99	1.363	0.0001760	8.587	2.576
3894.08	1.363	0.0001902	9.307	2.568
3906.25	1.363	0.0001914	9.395	2.560
4000.00	1.363	0.0006036	30.341	2.500
4100.00	1.363	0.0006504	33.512	2.439
4200.00	1.363	0.0006507	34.342	2.381
4347.00	1.363	0.0006590	36.000	2.300
4400.00	1.363	0.0006006	33.208	2.273
4500.00	1.363	0.0004941	27.940	2.222
4600.00	1.363	0.0003922	22.672	2.174
4700.00	1.363	0.0002947	17.404	2.128
4800.00	1.364	0.0002012	12.136	2.083
4900.00	1.364	0.0001115	6.868	2.041
5000.00	1.364	0.0000255	1.600	2.000

HEPTANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
670.00	1.384	0.0002138	1.800	14.925
680.00	1.385	0.0003511	3.000	14.706
690.00	1.387	0.0008534	7.400	14.493
700.00	1.389	0.0023305	20.500	14.286
714.29	1.393	0.0079693	71.533	14.000
715.10	1.395	0.0084916	76.307	13.984
715.92	1.397	0.0095802	86.189	13.968
716.74	1.399	0.0126335	113.787	13.952
717.57	1.399	0.0158397	142.830	13.936
718.39	1.397	0.0201053	181.502	13.920
719.22	1.393	0.0206127	186.298	13.904
720.05	1.391	0.0205999	186.397	13.888
720.88	1.391	0.0217601	197.122	13.872
722.54	1.384	0.0271890	246.868	13.840
723.38	1.379	0.0231430	210.376	13.824
724.22	1.378	0.0216145	196.709	13.808
725.06	1.377	0.0205690	187.412	13.792
725.90	1.375	0.0199091	181.610	13.776
726.74	1.373	0.0175695	160.453	13.760
727.59	1.372	0.0149191	136.408	13.744
728.44	1.372	0.0131301	120.191	13.728
729.29	1.373	0.0110685	101.438	13.712
730.14	1.374	0.0102522	94.066	13.696
730.99	1.375	0.0101877	93.583	13.680
733.57	1.375	0.0097983	90.324	13.632
734.43	1.375	0.0095850	88.461	13.616
736.16	1.375	0.0093589	86.578	13.584
739.65	1.374	0.0088042	81.832	13.520
740.52	1.374	0.0078121	72.696	13.504
741.40	1.374	0.0070814	65.975	13.488
744.05	1.374	0.0067300	62.926	13.440
744.93	1.374	0.0060474	56.611	13.424
745.82	1.374	0.0051613	48.373	13.408
746.71	1.374	0.0045111	42.330	13.392
747.61	1.374	0.0041351	38.849	13.376
748.50	1.375	0.0038619	36.325	13.360
749.40	1.375	0.0033509	31.556	13.344
750.30	1.375	0.0029023	27.365	13.328
751.20	1.376	0.0025830	24.383	13.312
752.11	1.376	0.0026287	24.845	13.296
753.01	1.377	0.0024029	22.738	13.280
753.92	1.377	0.0021603	20.467	13.264
754.83	1.378	0.0026304	24.951	13.248
755.74	1.378	0.0025260	23.989	13.232
756.66	1.379	0.0029253	27.815	13.216
757.58	1.379	0.0029680	28.256	13.200
758.50	1.379	0.0035268	33.616	13.184
759.42	1.379	0.0038641	36.875	13.168
760.34	1.379	0.0041449	39.603	13.152
762.20	1.380	0.0046204	44.255	13.120
764.06	1.379	0.0056103	53.867	13.088
764.99	1.379	0.0055577	53.427	13.072
765.93	1.379	0.0061707	59.393	13.056

HEPTANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
767.81	1.378	0.0063215	60.993	13.024
768.76	1.378	0.0062643	60.516	13.008
770.65	1.377	0.0065538	63.469	12.976
771.60	1.376	0.0059507	57.699	12.960
772.56	1.376	0.0054936	53.333	12.944
774.47	1.376	0.0047173	45.910	12.912
775.43	1.376	0.0041918	40.846	12.896
778.33	1.376	0.0036643	35.840	12.848
781.25	1.376	0.0035099	34.458	12.800
782.23	1.376	0.0034568	33.980	12.784
783.21	1.376	0.0032867	32.348	12.768
784.19	1.376	0.0034347	33.847	12.752
785.18	1.376	0.0029934	29.535	12.736
786.16	1.376	0.0029076	28.725	12.720
787.15	1.376	0.0025791	25.511	12.704
788.15	1.376	0.0023131	22.909	12.688
789.14	1.376	0.0020942	20.767	12.672
790.14	1.376	0.0015555	15.445	12.656
791.14	1.376	0.0013865	13.785	12.640
792.14	1.376	0.0011856	11.802	12.624
793.15	1.377	0.0011322	11.285	12.608
794.16	1.377	0.0011028	11.006	12.592
795.17	1.377	0.0009260	9.253	12.576
796.18	1.377	0.0009101	9.106	12.560
797.19	1.377	0.0008885	8.901	12.544
799.23	1.378	0.0008276	8.312	12.512
801.28	1.378	0.0007971	8.026	12.480
802.31	1.378	0.0007672	7.735	12.464
804.38	1.378	0.0007636	7.719	12.432
807.49	1.378	0.0007474	7.584	12.384
808.54	1.379	0.0007707	7.831	12.368
810.64	1.379	0.0007915	8.063	12.336
812.74	1.379	0.0008337	8.515	12.304
813.80	1.379	0.0008332	8.521	12.288
814.86	1.379	0.0008205	8.402	12.272
815.93	1.379	0.0008788	9.011	12.256
816.99	1.379	0.0009248	9.495	12.240
819.14	1.379	0.0009622	9.904	12.208
820.21	1.379	0.0010783	11.114	12.192
821.29	1.380	0.0010953	11.304	12.176
822.37	1.380	0.0011680	12.070	12.160
823.45	1.380	0.0013610	14.084	12.144
824.54	1.380	0.0014413	14.934	12.128
825.63	1.380	0.0014651	15.201	12.112
826.72	1.380	0.0016719	17.369	12.096
827.81	1.380	0.0017094	17.782	12.080
828.91	1.379	0.0016964	17.671	12.064
830.01	1.379	0.0017605	18.363	12.048
831.12	1.379	0.0018229	19.038	12.032
832.22	1.379	0.0016884	17.657	12.016
833.33	1.379	0.0015401	16.128	12.000
834.45	1.379	0.0015660	16.421	11.984
835.56	1.379	0.0014320	15.036	11.968
836.68	1.379	0.0012638	13.288	11.952
837.80	1.379	0.0012651	13.319	11.936
838.93	1.379	0.0012461	13.137	11.920

HEPTANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
840.05	1.379	0.0011383	12.016	11.904
841.18	1.380	0.0011486	12.141	11.888
842.32	1.380	0.0011535	12.210	11.872
843.45	1.380	0.0011191	11.861	11.856
844.59	1.380	0.0011101	11.782	11.840
845.74	1.380	0.0011714	12.450	11.824
846.88	1.380	0.0012260	13.047	11.808
848.03	1.380	0.0012030	12.820	11.792
849.18	1.380	0.0013021	13.895	11.776
850.34	1.380	0.0012827	13.706	11.760
851.50	1.380	0.0013523	14.470	11.744
852.66	1.380	0.0014317	15.341	11.728
853.83	1.380	0.0014041	15.065	11.712
854.99	1.380	0.0014105	15.155	11.696
856.16	1.380	0.0015292	16.452	11.680
857.34	1.380	0.0015252	16.432	11.664
858.52	1.381	0.0016400	17.693	11.648
859.70	1.381	0.0020581	22.235	11.632
860.88	1.380	0.0022011	23.811	11.616
862.07	1.380	0.0023002	24.918	11.600
863.26	1.380	0.0023893	25.919	11.584
864.45	1.380	0.0023001	24.986	11.568
865.65	1.380	0.0022733	24.729	11.552
866.85	1.380	0.0021113	22.999	11.536
868.06	1.380	0.0019525	21.298	11.520
869.26	1.380	0.0018236	19.920	11.504
870.47	1.380	0.0017347	18.975	11.488
871.69	1.380	0.0015546	17.029	11.472
872.91	1.380	0.0015916	17.459	11.456
874.13	1.380	0.0013479	14.806	11.440
875.35	1.380	0.0012972	14.269	11.424
876.58	1.380	0.0011553	12.726	11.408
877.81	1.380	0.0008366	9.229	11.392
879.04	1.380	0.0010120	11.179	11.376
880.28	1.381	0.0010749	11.891	11.360
881.52	1.381	0.0011638	12.892	11.344
882.77	1.381	0.0015674	17.387	11.328
884.02	1.381	0.0017754	19.723	11.312
885.27	1.381	0.0020586	22.901	11.296
886.52	1.381	0.0023410	26.079	11.280
887.78	1.381	0.0024670	27.522	11.264
889.05	1.381	0.0026094	29.152	11.248
890.31	1.381	0.0027292	30.534	11.232
891.58	1.381	0.0028408	31.828	11.216
892.86	1.381	0.0028730	32.235	11.200
894.13	1.380	0.0029965	33.669	11.184
895.42	1.380	0.0031331	35.254	11.168
896.70	1.380	0.0030035	33.844	11.152
897.99	1.380	0.0030480	34.395	11.136
899.28	1.379	0.0027332	30.887	11.120
900.58	1.379	0.0024689	27.940	11.104
901.88	1.379	0.0023388	26.506	11.088
903.18	1.379	0.0020133	22.851	11.072
904.49	1.380	0.0018826	21.397	11.056
905.80	1.380	0.0019694	22.417	11.040
907.11	1.380	0.0018814	21.447	11.024

HEPTANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
908.43	1.380	0.0020495	23.396	11.008
909.75	1.380	0.0021849	24.978	10.992
911.08	1.380	0.0021782	24.939	10.976
912.41	1.380	0.0022955	26.320	10.960
913.74	1.380	0.0022519	25.858	10.944
915.08	1.380	0.0021633	24.876	10.928
916.42	1.380	0.0021437	24.687	10.912
917.77	1.380	0.0020730	23.908	10.896
919.12	1.380	0.0020978	24.229	10.880
920.47	1.381	0.0021460	24.822	10.864
921.83	1.381	0.0022963	26.601	10.848
923.19	1.381	0.0025621	29.723	10.832
924.56	1.381	0.0028094	32.640	10.816
925.93	1.381	0.0032069	37.314	10.800
927.30	1.381	0.0035960	41.903	10.784
928.68	1.381	0.0037933	44.269	10.768
930.06	1.380	0.0041629	48.654	10.752
931.45	1.380	0.0041275	48.312	10.736
932.84	1.379	0.0042171	49.434	10.720
934.23	1.379	0.0039876	46.814	10.704
935.63	1.379	0.0038908	45.746	10.688
937.03	1.379	0.0037877	44.601	10.672
938.44	1.378	0.0036019	42.476	10.656
939.85	1.378	0.0033592	39.674	10.640
941.27	1.378	0.0032124	37.998	10.624
942.68	1.378	0.0028209	33.417	10.608
944.11	1.378	0.0026442	31.370	10.592
945.54	1.378	0.0022859	27.162	10.576
946.97	1.378	0.0019303	22.971	10.560
948.41	1.378	0.0016210	19.320	10.544
949.85	1.378	0.0013047	15.573	10.528
951.29	1.378	0.0011746	14.042	10.512
952.74	1.379	0.0011014	13.187	10.496
954.20	1.379	0.0011528	13.823	10.480
955.66	1.379	0.0013089	15.719	10.464
957.12	1.379	0.0014351	17.261	10.448
958.59	1.379	0.0016486	19.859	10.432
960.06	1.379	0.0017699	21.353	10.416
961.54	1.379	0.0020308	24.538	10.400
963.02	1.379	0.0020424	24.716	10.384
964.51	1.379	0.0020278	24.578	10.368
966.00	1.378	0.0017209	20.890	10.352
967.49	1.378	0.0013639	16.582	10.336
968.99	1.378	0.0010907	13.281	10.320
970.50	1.379	0.0007995	9.751	10.304
973.52	1.379	0.0007438	9.099	10.272
975.04	1.379	0.0007441	9.118	10.256
978.09	1.379	0.0007114	8.743	10.224
979.62	1.379	0.0007646	9.413	10.208
984.25	1.380	0.0008031	9.933	10.160
990.49	1.380	0.0008742	10.880	10.096
995.22	1.380	0.0008880	11.105	10.048
996.81	1.380	0.0009038	11.321	10.032
998.40	1.380	0.0009835	12.339	10.016
1001.60	1.380	0.0010019	12.610	9.984
1003.21	1.380	0.0010628	13.398	9.968

HEPTANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
1004.82	1.380	0.0011581	14.624	9.952
1006.44	1.381	0.0011146	14.096	9.936
1008.07	1.381	0.0012697	16.084	9.920
1009.69	1.381	0.0014346	18.202	9.904
1011.33	1.381	0.0014675	18.650	9.888
1012.97	1.381	0.0015444	19.659	9.872
1014.61	1.381	0.0018279	23.306	9.856
1016.26	1.381	0.0021740	27.763	9.840
1017.92	1.380	0.0021376	27.343	9.824
1019.58	1.380	0.0019088	24.457	9.808
1021.24	1.380	0.0018322	23.513	9.792
1022.91	1.380	0.0017679	22.726	9.776
1024.59	1.380	0.0016459	21.191	9.760
1026.27	1.380	0.0014333	18.485	9.744
1027.96	1.380	0.0012681	16.381	9.728
1029.65	1.380	0.0012296	15.909	9.712
1031.35	1.380	0.0012122	15.710	9.696
1033.06	1.380	0.0011613	15.076	9.680
1034.77	1.380	0.0011238	14.613	9.664
1036.48	1.380	0.0011406	14.856	9.648
1038.21	1.381	0.0012407	16.187	9.632
1039.93	1.381	0.0013911	18.180	9.616
1041.67	1.381	0.0014867	19.461	9.600
1043.41	1.381	0.0014533	19.055	9.584
1045.15	1.381	0.0014566	19.131	9.568
1046.90	1.381	0.0015487	20.375	9.552
1048.66	1.381	0.0016424	21.643	9.536
1050.42	1.381	0.0015896	20.983	9.520
1052.19	1.381	0.0015571	20.589	9.504
1053.96	1.381	0.0016377	21.690	9.488
1055.74	1.381	0.0018739	24.860	9.472
1057.53	1.381	0.0021797	28.966	9.456
1059.32	1.381	0.0021936	29.201	9.440
1061.12	1.381	0.0023224	30.968	9.424
1062.93	1.381	0.0026275	35.096	9.408
1064.74	1.381	0.0030934	41.389	9.392
1066.55	1.380	0.0032479	43.530	9.376
1068.38	1.380	0.0031822	42.724	9.360
1070.21	1.379	0.0029926	40.246	9.344
1072.04	1.379	0.0028292	38.114	9.328
1073.88	1.379	0.0024092	32.512	9.312
1075.73	1.379	0.0021247	28.722	9.296
1077.59	1.379	0.0017328	23.464	9.280
1079.45	1.379	0.0010876	14.754	9.264
1081.32	1.379	0.0010367	14.087	9.248
1083.19	1.379	0.0007931	10.796	9.232
1085.07	1.380	0.0008509	11.603	9.216
1086.96	1.380	0.0011454	15.645	9.200
1088.85	1.380	0.0009120	12.479	9.184
1090.75	1.380	0.0008631	11.830	9.168
1092.66	1.380	0.0008160	11.204	9.152
1094.57	1.380	0.0007303	10.045	9.136
1096.49	1.380	0.0006710	9.246	9.120
1098.42	1.380	0.0006514	8.992	9.104
1100.35	1.380	0.0006323	8.743	9.088
1102.29	1.380	0.0006491	8.992	9.072

HEPTANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
1104.24	1.380	0.0006663	9.246	9.056
1106.20	1.380	0.0006839	9.506	9.040
1108.16	1.381	0.0007018	9.773	9.024
1110.12	1.381	0.0007201	10.045	9.008
1112.10	1.381	0.0007388	10.324	8.992
1114.08	1.381	0.0007579	10.610	8.976
1116.07	1.381	0.0007774	10.903	8.960
1118.07	1.381	0.0008132	11.426	8.944
1120.07	1.381	0.0009761	13.739	8.928
1122.08	1.381	0.0011775	16.603	8.912
1124.10	1.381	0.0013905	19.642	8.896
1128.16	1.382	0.0015210	21.562	8.864
1130.20	1.382	0.0018725	26.594	8.848
1132.25	1.382	0.0022209	31.599	8.832
1134.30	1.381	0.0025894	36.909	8.816
1136.36	1.381	0.0025999	37.126	8.800
1138.43	1.380	0.0025877	37.019	8.784
1140.51	1.380	0.0024709	35.413	8.768
1142.60	1.380	0.0021656	31.094	8.752
1144.69	1.380	0.0018643	26.817	8.736
1146.79	1.380	0.0014413	20.770	8.720
1148.90	1.380	0.0013377	19.313	8.704
1151.01	1.380	0.0012465	18.029	8.688
1153.14	1.380	0.0011748	17.023	8.672
1155.27	1.380	0.0011978	17.389	8.656
1157.41	1.380	0.0012452	18.111	8.640
1159.56	1.380	0.0011800	17.194	8.624
1161.71	1.380	0.0011457	16.726	8.608
1163.87	1.380	0.0010617	15.528	8.592
1166.05	1.380	0.0009148	13.404	8.576
1168.22	1.380	0.0007657	11.241	8.560
1170.41	1.381	0.0006859	10.088	8.544
1172.61	1.381	0.0006524	9.614	8.528
1174.81	1.381	0.0006463	9.541	8.512
1177.02	1.381	0.0006290	9.304	8.496
1179.25	1.381	0.0006057	8.975	8.480
1181.47	1.381	0.0006048	8.980	8.464
1183.71	1.381	0.0006443	9.584	8.448
1185.96	1.381	0.0006992	10.420	8.432
1188.21	1.381	0.0007554	11.279	8.416
1190.48	1.382	0.0008343	12.480	8.400
1192.75	1.382	0.0009452	14.167	8.384
1195.03	1.382	0.0011275	16.932	8.368
1197.32	1.381	0.0011621	17.484	8.352
1199.62	1.381	0.0008980	13.538	8.336
1201.92	1.381	0.0007819	11.810	8.320
1204.24	1.382	0.0006976	10.556	8.304
1206.56	1.382	0.0006663	10.102	8.288
1208.90	1.382	0.0005838	8.868	8.272
1211.24	1.382	0.0007748	11.793	8.256
1213.59	1.382	0.0010584	16.141	8.240
1215.95	1.382	0.0012712	19.424	8.224
1218.32	1.382	0.0014192	21.729	8.208
1220.70	1.382	0.0014128	21.672	8.192
1223.09	1.382	0.0011063	17.004	8.176
1225.49	1.382	0.0009222	14.202	8.160

HEPTANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
1227.90	1.382	0.0010707	16.522	8.144
1230.32	1.382	0.0010706	16.552	8.128
1232.74	1.383	0.0011645	18.040	8.112
1235.18	1.383	0.0014183	22.014	8.096
1237.62	1.382	0.0014763	22.960	8.080
1240.08	1.382	0.0015243	23.753	8.064
1242.55	1.382	0.0015300	23.890	8.048
1245.02	1.382	0.0012566	19.661	8.032
1247.51	1.382	0.0009083	14.240	8.016
1250.00	1.383	0.0007907	12.420	8.000
1252.51	1.383	0.0006292	9.904	7.984
1255.02	1.383	0.0005385	8.492	7.968
1257.55	1.384	0.0008807	13.918	7.952
1260.08	1.384	0.0013463	21.318	7.936
1262.63	1.384	0.0017400	27.607	7.920
1265.18	1.384	0.0022320	35.486	7.904
1267.75	1.384	0.0025603	40.787	7.888
1270.33	1.384	0.0027726	44.261	7.872
1272.91	1.383	0.0026467	42.336	7.856
1275.51	1.383	0.0023560	37.763	7.840
1278.12	1.383	0.0020709	33.261	7.824
1280.74	1.383	0.0015806	25.439	7.808
1283.37	1.384	0.0016617	26.800	7.792
1286.01	1.384	0.0020518	33.158	7.776
1288.66	1.385	0.0026843	43.469	7.760
1291.32	1.384	0.0030989	50.287	7.744
1294.00	1.384	0.0034599	56.261	7.728
1296.68	1.384	0.0036184	58.960	7.712
1299.38	1.383	0.0031357	51.201	7.696
1302.08	1.383	0.0026168	42.818	7.680
1304.80	1.383	0.0023617	38.724	7.664
1307.53	1.384	0.0021417	35.191	7.648
1310.27	1.384	0.0019760	32.536	7.632
1313.03	1.385	0.0023543	38.846	7.616
1315.79	1.385	0.0028011	46.316	7.600
1318.57	1.385	0.0031368	51.975	7.584
1321.35	1.385	0.0033579	55.756	7.568
1324.15	1.385	0.0034847	57.984	7.552
1326.96	1.385	0.0034972	58.316	7.536
1329.79	1.385	0.0035718	59.687	7.520
1332.62	1.385	0.0036443	61.028	7.504
1335.47	1.385	0.0035329	59.290	7.488
1338.33	1.384	0.0031478	52.940	7.472
1341.20	1.385	0.0025394	42.800	7.456
1344.09	1.386	0.0021740	36.720	7.440
1346.98	1.386	0.0021703	36.735	7.424
1349.89	1.387	0.0024764	42.007	7.408
1352.81	1.388	0.0029296	49.804	7.392
1355.75	1.389	0.0036926	62.911	7.376
1358.70	1.390	0.0046132	78.766	7.360
1361.66	1.391	0.0060028	102.714	7.344
1364.63	1.392	0.0084240	144.459	7.328
1367.62	1.392	0.0113068	194.320	7.312
1370.61	1.390	0.0162208	279.380	7.296
1373.63	1.384	0.0185650	320.461	7.280
1376.65	1.379	0.0144116	249.314	7.264

HEPTANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
1379.69	1.377	0.0105991	183.764	7.248
1382.74	1.377	0.0072928	126.721	7.232
1385.81	1.379	0.0050184	87.394	7.216
1388.89	1.380	0.0036863	64.339	7.200
1391.98	1.382	0.0028285	49.476	7.184
1395.09	1.383	0.0023413	41.046	7.168
1398.21	1.385	0.0022517	39.563	7.152
1401.35	1.386	0.0024782	43.641	7.136
1404.49	1.388	0.0028269	49.894	7.120
1407.66	1.389	0.0033425	59.126	7.104
1410.84	1.390	0.0040410	71.644	7.088
1414.03	1.391	0.0049531	88.012	7.072
1417.23	1.392	0.0058153	103.567	7.056
1420.46	1.394	0.0065180	116.346	7.040
1423.69	1.397	0.0070221	125.630	7.024
1426.94	1.399	0.0129002	231.320	7.008
1430.21	1.398	0.0147846	265.718	6.992
1433.49	1.399	0.0181031	326.105	6.976
1436.78	1.399	0.0206281	372.442	6.960
1440.09	1.399	0.0244107	441.754	6.944
1443.42	1.399	0.0294199	533.634	6.928
1446.76	1.397	0.0346696	630.311	6.912
1450.12	1.393	0.0413456	753.430	6.896
1453.49	1.385	0.0480419	877.491	6.880
1456.88	1.375	0.0493277	903.076	6.864
1460.28	1.364	0.0480729	882.158	6.848
1463.70	1.353	0.0416025	765.212	6.832
1467.14	1.347	0.0307893	567.652	6.816
1470.59	1.347	0.0209971	388.027	6.800
1474.06	1.350	0.0145792	270.059	6.784
1477.54	1.351	0.0116196	215.745	6.768
1481.04	1.354	0.0059042	109.885	6.752
1484.56	1.358	0.0043583	81.307	6.736
1488.10	1.360	0.0036922	69.045	6.720
1491.65	1.362	0.0032905	61.678	6.704
1495.22	1.363	0.0032083	60.282	6.688
1498.80	1.364	0.0027143	51.122	6.672
1502.40	1.365	0.0022259	42.025	6.656
1506.02	1.366	0.0016213	30.684	6.640
1520.68	1.369	0.0015175	28.999	6.576
1524.39	1.369	0.0014804	28.359	6.560
1539.41	1.371	0.0011019	21.317	6.496
1547.03	1.371	0.0009687	18.831	6.464
1550.87	1.372	0.0008557	16.676	6.448
1554.73	1.372	0.0008460	16.528	6.432
1558.60	1.372	0.0007493	14.677	6.416
1562.50	1.372	0.0007412	14.554	6.400
1566.42	1.373	0.0007397	14.561	6.384
1570.35	1.373	0.0006606	13.037	6.368
1574.31	1.373	0.0006520	12.900	6.352
1578.28	1.373	0.0006365	12.624	6.336
1582.28	1.373	0.0006073	12.076	6.320
1586.29	1.373	0.0005985	11.930	6.304
1590.33	1.374	0.0005813	11.617	6.288
1594.39	1.374	0.0005477	10.973	6.272
1602.56	1.374	0.0005309	10.692	6.240

HEPTANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
1606.68	1.374	0.0005052	10.200	6.224
1610.83	1.374	0.0004743	9.601	6.208
1614.99	1.374	0.0004687	9.511	6.192
1619.17	1.374	0.0004485	9.125	6.176
1623.38	1.375	0.0004133	8.431	6.160
1631.85	1.375	0.0004104	8.416	6.128
1640.42	1.375	0.0004045	8.339	6.096
1644.74	1.375	0.0004092	8.457	6.080
1653.44	1.375	0.0004020	8.353	6.048
1662.23	1.375	0.0003977	8.308	6.016
1666.67	1.375	0.0003925	8.221	6.000
1671.12	1.376	0.0003887	8.163	5.984
1680.11	1.376	0.0003751	7.919	5.952
1684.64	1.376	0.0003670	7.768	5.936
1693.77	1.376	0.0003569	7.597	5.904
1698.37	1.376	0.0003033	6.473	5.888
1703.00	1.376	0.0002852	6.104	5.872
1707.65	1.376	0.0002569	5.513	5.856
1712.33	1.376	0.0002329	5.011	5.840
1717.03	1.376	0.0002201	4.750	5.824
1726.52	1.376	0.0002038	4.423	5.792
1750.70	1.377	0.0001957	4.305	5.712
1755.62	1.377	0.0001881	4.151	5.696
1760.56	1.377	0.0001937	4.285	5.680
1765.54	1.377	0.0001668	3.701	5.664
1770.54	1.377	0.0001674	3.724	5.648
1775.57	1.377	0.0001489	3.323	5.632
1780.63	1.377	0.0001420	3.177	5.616
1785.71	1.377	0.0001289	2.893	5.600
1790.83	1.377	0.0001358	3.057	5.584
1795.98	1.377	0.0001283	2.895	5.568
1801.15	1.377	0.0001059	2.398	5.552
1806.36	1.377	0.0000958	2.175	5.536
1811.59	1.377	0.0000899	2.048	5.520
1816.86	1.377	0.0000790	1.805	5.504
1822.16	1.377	0.0000735	1.684	5.488
1827.49	1.377	0.0000707	1.623	5.472
1832.85	1.377	0.0000820	1.888	5.456
1838.24	1.377	0.0000960	2.218	5.440
1843.66	1.377	0.0000963	2.231	5.424
1849.11	1.377	0.0001116	2.593	5.408
1851.85	1.377	0.0000933	2.171	5.400
1854.60	1.377	0.0000999	2.328	5.392
1857.36	1.378	0.0001073	2.505	5.384
1860.12	1.378	0.0001101	2.573	5.376
1862.89	1.378	0.0001124	2.631	5.368
1865.67	1.378	0.0001161	2.723	5.360
1868.46	1.378	0.0001195	2.806	5.352
1871.26	1.378	0.0001253	2.945	5.344
1874.06	1.378	0.0001344	3.165	5.336
1876.88	1.378	0.0001487	3.506	5.328
1879.70	1.378	0.0001528	3.609	5.320
1882.53	1.378	0.0001563	3.697	5.312
1885.37	1.378	0.0001597	3.782	5.304
1888.22	1.378	0.0001511	3.586	5.296
1891.07	1.378	0.0001430	3.397	5.288

HEPTANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
1893.94	1.378	0.0001313	3.125	5.280
1896.81	1.378	0.0001248	2.974	5.272
1899.70	1.378	0.0001162	2.774	5.264
1902.59	1.378	0.0001027	2.456	5.256
1905.49	1.378	0.0000961	2.302	5.248
1908.40	1.378	0.0000917	2.198	5.240
1911.32	1.378	0.0000879	2.111	5.232
1914.24	1.378	0.0000864	2.079	5.224
1917.18	1.378	0.0000885	2.133	5.216
1920.12	1.378	0.0000936	2.258	5.208
1923.08	1.378	0.0000940	2.271	5.200
1926.04	1.378	0.0001000	2.420	5.192
1929.01	1.378	0.0001016	2.462	5.184
1931.99	1.378	0.0000984	2.390	5.176
1934.99	1.378	0.0001057	2.570	5.168
1937.98	1.378	0.0001022	2.490	5.160
1940.99	1.378	0.0001009	2.462	5.152
1944.01	1.378	0.0001006	2.459	5.144
1947.04	1.378	0.0000921	2.254	5.136
1950.08	1.378	0.0000862	2.113	5.128
1953.13	1.378	0.0000836	2.052	5.120
1956.18	1.378	0.0000764	1.879	5.112
1959.25	1.378	0.0000771	1.897	5.104
1962.32	1.378	0.0000748	1.845	5.096
1965.41	1.378	0.0000737	1.820	5.088
1968.50	1.378	0.0000727	1.799	5.080
1971.61	1.378	0.0000755	1.870	5.072
1974.72	1.378	0.0000761	1.889	5.064
1977.85	1.378	0.0000784	1.950	5.056
1980.98	1.378	0.0000830	2.066	5.048
1984.13	1.378	0.0000814	2.030	5.040
1987.28	1.378	0.0000852	2.128	5.032
1990.45	1.378	0.0000844	2.112	5.024
1993.62	1.378	0.0000900	2.255	5.016
1996.81	1.378	0.0000974	2.444	5.008
2000.00	1.378	0.0001070	2.689	5.000
2003.21	1.378	0.0001229	3.093	4.992
2006.42	1.379	0.0001438	3.625	4.984
2009.65	1.379	0.0001601	4.042	4.976
2012.88	1.379	0.0001848	4.674	4.968
2016.13	1.379	0.0002006	5.083	4.960
2019.39	1.379	0.0002175	5.520	4.952
2022.65	1.379	0.0002291	5.822	4.944
2025.93	1.379	0.0002339	5.954	4.936
2029.22	1.379	0.0002321	5.918	4.928
2032.52	1.379	0.0002274	5.808	4.920
2035.83	1.379	0.0002131	5.451	4.912
2039.15	1.379	0.0002050	5.253	4.904
2042.48	1.379	0.0001853	4.756	4.896
2045.83	1.379	0.0001714	4.408	4.888
2049.18	1.379	0.0001590	4.094	4.880
2052.55	1.379	0.0001430	3.689	4.872
2055.92	1.379	0.0001382	3.571	4.864
2059.31	1.379	0.0001301	3.366	4.856
2062.71	1.379	0.0001220	3.163	4.848
2066.12	1.379	0.0001201	3.117	4.840

HEPTANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
2079.87	1.379	0.0001177	3.077	4.808
2083.33	1.379	0.0001136	2.975	4.800
2086.81	1.379	0.0001126	2.953	4.792
2090.30	1.379	0.0001134	2.980	4.784
2093.80	1.379	0.0001101	2.898	4.776
2097.32	1.379	0.0001131	2.981	4.768
2100.84	1.379	0.0001110	2.930	4.760
2104.38	1.379	0.0001111	2.938	4.752
2107.93	1.379	0.0001118	2.962	4.744
2111.49	1.379	0.0001149	3.048	4.736
2115.06	1.379	0.0001200	3.191	4.728
2118.64	1.379	0.0001262	3.359	4.720
2122.24	1.379	0.0001348	3.594	4.712
2125.85	1.379	0.0001415	3.781	4.704
2129.47	1.379	0.0001510	4.040	4.696
2133.11	1.379	0.0001676	4.494	4.688
2136.75	1.379	0.0001815	4.875	4.680
2140.41	1.379	0.0001949	5.242	4.672
2144.08	1.379	0.0002055	5.537	4.664
2147.77	1.379	0.0002151	5.807	4.656
2151.46	1.379	0.0002135	5.772	4.648
2155.17	1.379	0.0002161	5.852	4.640
2158.90	1.379	0.0002178	5.908	4.632
2162.63	1.379	0.0002150	5.842	4.624
2166.38	1.379	0.0002148	5.849	4.616
2170.14	1.379	0.0002083	5.680	4.608
2173.91	1.379	0.0002095	5.722	4.600
2177.70	1.379	0.0002076	5.680	4.592
2181.50	1.379	0.0002105	5.770	4.584
2185.32	1.379	0.0002093	5.747	4.576
2189.14	1.379	0.0002087	5.741	4.568
2192.98	1.379	0.0002134	5.882	4.560
2196.84	1.380	0.0002144	5.919	4.552
2200.70	1.380	0.0002244	6.205	4.544
2204.59	1.380	0.0002284	6.329	4.536
2208.48	1.380	0.0002332	6.473	4.528
2212.39	1.380	0.0002348	6.528	4.520
2216.31	1.380	0.0002347	6.537	4.512
2220.25	1.380	0.0002341	6.532	4.504
2224.20	1.380	0.0002288	6.395	4.496
2228.16	1.380	0.0002248	6.294	4.488
2232.14	1.380	0.0002151	6.034	4.480
2236.14	1.380	0.0002125	5.971	4.472
2240.14	1.380	0.0002053	5.780	4.464
2244.17	1.380	0.0002076	5.856	4.456
2248.20	1.380	0.0002074	5.860	4.448
2252.25	1.380	0.0002070	5.859	4.440
2256.32	1.380	0.0002140	6.067	4.432
2260.40	1.380	0.0002203	6.258	4.424
2264.49	1.380	0.0002288	6.511	4.416
2268.60	1.380	0.0002383	6.793	4.408
2272.73	1.380	0.0002466	7.044	4.400
2276.87	1.380	0.0002555	7.309	4.392
2281.02	1.380	0.0002633	7.548	4.384
2285.19	1.380	0.0002748	7.890	4.376
2289.38	1.380	0.0002844	8.183	4.368

HEPTANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
2293.58	1.380	0.0002903	8.366	4.360
2297.79	1.380	0.0002998	8.656	4.352
2302.03	1.380	0.0003111	8.998	4.344
2306.27	1.380	0.0003194	9.257	4.336
2310.54	1.380	0.0003319	9.637	4.328
2314.82	1.380	0.0003358	9.768	4.320
2319.11	1.380	0.0003418	9.961	4.312
2323.42	1.380	0.0003453	10.080	4.304
2327.75	1.380	0.0003438	10.056	4.296
2332.09	1.380	0.0003363	9.856	4.288
2336.45	1.380	0.0003275	9.617	4.280
2340.82	1.380	0.0003285	9.663	4.272
2345.22	1.380	0.0003286	9.685	4.264
2349.62	1.381	0.0003242	9.571	4.256
2354.05	1.381	0.0003383	10.007	4.248
2358.49	1.381	0.0003375	10.002	4.240
2362.95	1.381	0.0003472	10.311	4.232
2367.42	1.381	0.0003623	10.778	4.224
2371.92	1.381	0.0003730	11.119	4.216
2376.43	1.381	0.0003686	11.009	4.208
2380.95	1.381	0.0003687	11.031	4.200
2385.50	1.381	0.0003688	11.055	4.192
2390.06	1.381	0.0003646	10.951	4.184
2394.64	1.381	0.0003450	10.383	4.176
2399.23	1.381	0.0003277	9.879	4.168
2403.85	1.381	0.0003072	9.281	4.160
2408.48	1.381	0.0002855	8.640	4.152
2413.13	1.381	0.0002678	8.121	4.144
2417.80	1.381	0.0002495	7.581	4.136
2422.48	1.381	0.0002357	7.176	4.128
2427.18	1.381	0.0002238	6.826	4.120
2431.91	1.381	0.0002141	6.543	4.112
2436.65	1.381	0.0002074	6.351	4.104
2441.41	1.381	0.0002002	6.142	4.096
2446.18	1.381	0.0001965	6.041	4.088
2450.98	1.381	0.0001958	6.031	4.080
2455.80	1.382	0.0001953	6.028	4.072
2460.63	1.382	0.0001952	6.036	4.064
2465.48	1.382	0.0001987	6.156	4.056
2470.36	1.382	0.0002031	6.305	4.048
2475.25	1.382	0.0002103	6.542	4.040
2480.16	1.382	0.0002180	6.793	4.032
2485.09	1.382	0.0002260	7.058	4.024
2490.04	1.382	0.0002404	7.521	4.016
2495.01	1.382	0.0002555	8.009	4.008
2500.00	1.382	0.0002743	8.618	4.000
2505.01	1.382	0.0003188	10.034	3.992
2510.04	1.382	0.0003190	10.061	3.984
2515.09	1.383	0.0003230	10.210	3.976
2520.16	1.383	0.0003355	10.626	3.968
2525.25	1.383	0.0003441	10.919	3.960
2530.36	1.383	0.0003533	11.235	3.952
2535.50	1.383	0.0003623	11.544	3.944
2540.65	1.383	0.0003787	12.090	3.936
2545.83	1.383	0.0004015	12.845	3.928
2551.02	1.383	0.0004319	13.847	3.920

HEPTANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
2556.24	1.383	0.0004734	15.207	3.912
2561.48	1.384	0.0005322	17.130	3.904
2566.74	1.384	0.0005895	19.015	3.896
2572.02	1.384	0.0006592	21.307	3.888
2577.32	1.384	0.0007261	23.518	3.880
2582.65	1.384	0.0007926	25.722	3.872
2587.99	1.384	0.0008438	27.441	3.864
2593.36	1.384	0.0008825	28.760	3.856
2598.75	1.384	0.0009239	30.171	3.848
2604.17	1.384	0.0009473	31.000	3.840
2609.60	1.384	0.0009747	31.963	3.832
2615.06	1.384	0.0009996	32.849	3.824
2620.55	1.385	0.0010048	33.089	3.816
2626.05	1.385	0.0010415	34.368	3.808
2631.58	1.385	0.0010671	35.288	3.800
2648.31	1.385	0.0010902	36.281	3.776
2653.93	1.385	0.0011027	36.776	3.768
2659.57	1.386	0.0010759	35.956	3.760
2688.17	1.387	0.0010692	36.116	3.720
2693.97	1.387	0.0011151	37.751	3.712
2699.78	1.387	0.0011485	38.965	3.704
2705.63	1.388	0.0011831	40.225	3.696
2711.50	1.388	0.0012417	42.309	3.688
2717.39	1.389	0.0013441	45.899	3.680
2723.31	1.389	0.0014187	48.551	3.672
2729.26	1.389	0.0014950	51.275	3.664
2735.23	1.390	0.0015348	52.753	3.656
2741.23	1.390	0.0015281	52.639	3.648
2747.25	1.391	0.0015311	52.858	3.640
2753.30	1.391	0.0015310	52.971	3.632
2759.38	1.392	0.0016113	55.871	3.624
2765.49	1.393	0.0017347	60.284	3.616
2771.62	1.394	0.0019870	69.207	3.608
2777.78	1.395	0.0023230	81.089	3.600
2783.96	1.396	0.0029683	103.845	3.592
2790.18	1.397	0.0032393	113.577	3.584
2796.42	1.399	0.0037394	131.407	3.576
2802.69	1.400	0.0044068	155.206	3.568
2808.99	1.403	0.0050833	179.436	3.560
2815.32	1.405	0.0066693	235.950	3.552
2821.67	1.408	0.0094662	335.654	3.544
2828.05	1.411	0.0130249	462.883	3.536
2834.47	1.412	0.0193230	688.267	3.528
2840.91	1.412	0.0235191	839.631	3.520
2847.38	1.411	0.0290282	1038.663	3.512
2853.88	1.408	0.0334943	1201.203	3.504
2860.41	1.404	0.0366468	1317.268	3.496
2866.97	1.400	0.0386010	1390.693	3.488
2873.56	1.396	0.0398765	1439.949	3.480
2880.18	1.394	0.0378746	1370.812	3.472
2886.84	1.394	0.0385780	1399.498	3.464
2893.52	1.395	0.0417173	1516.883	3.456
2900.23	1.394	0.0464242	1691.948	3.448
2906.98	1.391	0.0520679	1902.050	3.440
2913.75	1.385	0.0588685	2155.487	3.432
2920.56	1.374	0.0640455	2350.522	3.424

HEPTANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
2927.40	1.360	0.0632995	2328.584	3.416
2934.27	1.347	0.0553506	2040.950	3.408
2941.18	1.340	0.0438177	1619.500	3.400
2948.11	1.338	0.0341301	1264.419	3.392
2955.08	1.338	0.0265285	985.127	3.384
2962.09	1.339	0.0203270	756.626	3.376
2969.12	1.341	0.0142096	530.175	3.368
2976.19	1.344	0.0090495	338.452	3.360
2983.29	1.348	0.0060432	226.556	3.352
2990.43	1.352	0.0048758	183.228	3.344
2997.60	1.355	0.0040683	153.250	3.336
3071.25	1.365	0.0039025	150.616	3.256
3078.82	1.365	0.0038109	147.444	3.248
3086.42	1.366	0.0037401	145.060	3.240
3094.06	1.366	0.0036927	143.577	3.232
3101.74	1.366	0.0036598	142.649	3.224
3109.45	1.366	0.0036386	142.176	3.216
3117.21	1.366	0.0036175	141.705	3.208
3125.00	1.366	0.0036077	141.674	3.200
3132.83	1.366	0.0020857	82.111	3.192
3140.70	1.367	0.0020680	81.618	3.184
3148.62	1.367	0.0020680	81.826	3.176
3156.57	1.368	0.0020588	81.667	3.168
3164.56	1.368	0.0020392	81.091	3.160
3172.59	1.368	0.0020110	80.173	3.152
3180.66	1.368	0.0019768	79.010	3.144
3188.78	1.367	0.0019242	77.106	3.136
3196.93	1.367	0.0003639	14.618	3.128
3205.13	1.368	0.0002970	11.960	3.120
3213.37	1.369	0.0002395	9.672	3.112
3221.65	1.369	0.0001908	7.726	3.104
3246.75	1.370	0.0001726	7.043	3.080
3255.21	1.370	0.0001558	6.374	3.072
3263.71	1.370	0.0001410	5.782	3.064
3272.25	1.371	0.0001290	5.305	3.056
3280.84	1.371	0.0001225	5.052	3.048
3289.47	1.371	0.0001161	4.797	3.040
3298.15	1.371	0.0001123	4.656	3.032
3306.88	1.371	0.0001114	4.629	3.024
3315.65	1.371	0.0001115	4.645	3.016
3324.47	1.372	0.0001143	4.775	3.008
3333.33	1.372	0.0001153	4.831	3.000
3342.25	1.372	0.0001172	4.924	2.992
3351.21	1.372	0.0001166	4.910	2.984
3360.22	1.372	0.0001159	4.892	2.976
3369.27	1.372	0.0001127	4.772	2.968
3378.38	1.372	0.0001092	4.634	2.960
3387.53	1.372	0.0001038	4.420	2.952
3396.74	1.373	0.0000962	4.108	2.944
3406.00	1.373	0.0000898	3.845	2.936
3415.30	1.373	0.0000824	3.535	2.928
3424.66	1.373	0.0000754	3.243	2.920
3434.07	1.373	0.0000674	2.907	2.912
3443.53	1.373	0.0000592	2.561	2.904
3453.04	1.373	0.0000519	2.253	2.896
3462.60	1.373	0.0000457	1.988	2.888

HEPTANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
3472.22	1.373	0.0000414	1.804	2.880
3481.89	1.373	0.0000371	1.625	2.872
3491.62	1.373	0.0000350	1.537	2.864
3501.40	1.374	0.0000320	1.410	2.856
3511.24	1.374	0.0000343	1.514	2.848
3521.13	1.374	0.0000375	1.660	2.840
3531.07	1.374	0.0000430	1.908	2.832
3541.08	1.374	0.0000510	2.270	2.824
3551.14	1.374	0.0000613	2.734	2.816
3561.25	1.374	0.0000749	3.351	2.808
3571.43	1.374	0.0000938	4.208	2.800
3581.66	1.374	0.0001105	4.974	2.792
3591.95	1.374	0.0001272	5.741	2.784
3602.31	1.374	0.0001439	6.513	2.776
3612.72	1.374	0.0001562	7.092	2.768
3623.19	1.374	0.0001642	7.476	2.760
3633.72	1.374	0.0001664	7.600	2.752
3644.32	1.374	0.0001685	7.716	2.744
3654.97	1.374	0.0001676	7.700	2.736
3665.69	1.374	0.0001658	7.636	2.728
3676.47	1.375	0.0001633	7.542	2.720
3687.32	1.375	0.0001620	7.505	2.712
3698.23	1.375	0.0001602	7.445	2.704
3709.20	1.375	0.0001610	7.506	2.696
3720.24	1.375	0.0001632	7.630	2.688
3731.34	1.375	0.0001664	7.803	2.680
3742.52	1.375	0.0001683	7.914	2.672
3753.75	1.375	0.0001736	8.190	2.664
3765.06	1.375	0.0001805	8.539	2.656
3776.44	1.375	0.0001802	8.552	2.648
3787.88	1.375	0.0001812	8.623	2.640
3799.39	1.375	0.0001824	8.708	2.632
3810.98	1.375	0.0001844	8.831	2.624
3822.63	1.375	0.0001828	8.782	2.616
3834.36	1.375	0.0001852	8.925	2.608
3846.15	1.375	0.0001865	9.013	2.600
3858.03	1.375	0.0001884	9.132	2.592
3869.97	1.375	0.0001861	9.048	2.584
3881.99	1.375	0.0001944	9.485	2.576
3894.08	1.375	0.0001955	9.569	2.568
3906.25	1.375	0.0001937	9.507	2.560
4000.00	1.376	0.0003959	19.900	2.500
4100.00	1.376	0.0004386	22.600	2.439
4200.00	1.376	0.0005551	29.300	2.381
4300.00	1.376	0.0006662	36.000	2.326
4400.00	1.376	0.0005607	31.000	2.273
4500.00	1.376	0.0004598	26.000	2.222
4600.00	1.376	0.0003633	21.000	2.174
4700.00	1.376	0.0002709	16.000	2.128
4800.00	1.376	0.0001658	10.000	2.083
4900.00	1.376	0.0000974	6.000	2.041
5000.00	1.376	0.0000286	1.800	2.000

NONANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
667.00	1.401	0.0005071	4.250	14.993
678.00	1.403	0.0006033	5.140	14.749
691.00	1.405	0.0014764	12.820	14.472
702.00	1.408	0.0033282	29.360	14.245
707.00	1.409	0.0059272	52.660	14.144
713.00	1.411	0.0103239	92.500	14.025
714.29	1.412	0.0110644	99.314	14.000
715.10	1.413	0.0142774	128.300	13.984
716.74	1.412	0.0145473	131.025	13.952
717.57	1.415	0.0168008	151.497	13.936
718.39	1.415	0.0237002	213.955	13.920
719.22	1.409	0.0276853	250.219	13.904
720.88	1.401	0.0258036	233.751	13.872
722.54	1.395	0.0251213	228.094	13.840
723.38	1.393	0.0207316	188.456	13.824
725.06	1.392	0.0191310	174.310	13.792
725.90	1.391	0.0168502	153.706	13.776
726.74	1.391	0.0152322	139.108	13.760
727.59	1.392	0.0146993	134.398	13.744
729.29	1.391	0.0144792	132.695	13.712
730.14	1.391	0.0131083	120.271	13.696
731.85	1.391	0.0128198	117.900	13.664
732.71	1.391	0.0127060	116.991	13.648
733.57	1.390	0.0115246	106.237	13.632
734.43	1.391	0.0110268	101.768	13.616
736.16	1.390	0.0106681	98.689	13.584
737.03	1.390	0.0092053	85.258	13.568
737.90	1.390	0.0092574	85.841	13.552
738.77	1.390	0.0092747	86.103	13.536
739.64	1.389	0.0082734	76.898	13.520
740.52	1.389	0.0069218	64.412	13.504
742.28	1.390	0.0062564	58.358	13.472
744.05	1.391	0.0055209	51.620	13.440
746.71	1.392	0.0052375	49.146	13.392
747.61	1.392	0.0049717	46.708	13.376
748.50	1.392	0.0046712	43.937	13.360
749.40	1.392	0.0041266	38.861	13.344
750.30	1.393	0.0045015	42.443	13.328
751.20	1.393	0.0046971	44.340	13.312
752.11	1.393	0.0042006	39.701	13.296
753.01	1.394	0.0045974	43.503	13.280
753.92	1.394	0.0050213	47.572	13.264
759.42	1.393	0.0047537	45.365	13.168
761.27	1.393	0.0044762	42.821	13.136
762.20	1.393	0.0044685	42.800	13.120
763.13	1.393	0.0038611	37.027	13.104
764.99	1.393	0.0038650	37.155	13.072
766.87	1.393	0.0035663	34.368	13.040
770.65	1.394	0.0036007	34.870	12.976
772.56	1.394	0.0039502	38.350	12.944
773.51	1.394	0.0039068	37.975	12.928
774.47	1.394	0.0054737	53.272	12.912
775.43	1.392	0.0040319	39.288	12.896

NONANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
776.40	1.393	0.0034493	33.653	12.880
779.30	1.393	0.0029430	28.821	12.832
781.25	1.393	0.0028499	27.979	12.800
783.21	1.393	0.0026151	25.738	12.768
784.19	1.393	0.0023177	22.840	12.752
786.16	1.393	0.0022801	22.526	12.720
787.15	1.393	0.0019243	19.034	12.704
789.14	1.393	0.0018449	18.295	12.672
790.14	1.394	0.0015335	15.226	12.656
791.14	1.394	0.0015321	15.232	12.640
792.14	1.394	0.0014916	14.848	12.624
793.15	1.394	0.0012591	12.549	12.608
794.16	1.394	0.0011994	11.970	12.592
795.17	1.394	0.0011626	11.617	12.576
796.18	1.394	0.0009999	10.004	12.560
797.19	1.394	0.0009268	9.284	12.544
798.21	1.395	0.0009181	9.209	12.528
799.23	1.395	0.0008472	8.509	12.512
802.31	1.395	0.0008184	8.251	12.464
804.38	1.395	0.0008212	8.301	12.432
806.45	1.396	0.0008307	8.418	12.400
807.49	1.396	0.0008281	8.403	12.384
808.54	1.396	0.0009150	9.297	12.368
810.64	1.396	0.0009329	9.503	12.336
811.69	1.396	0.0010250	10.455	12.320
813.80	1.396	0.0010383	10.618	12.288
814.86	1.396	0.0011760	12.042	12.272
815.93	1.396	0.0011878	12.179	12.256
816.99	1.396	0.0011972	12.291	12.240
818.06	1.396	0.0013444	13.821	12.224
819.13	1.396	0.0014263	14.682	12.208
820.21	1.397	0.0014194	14.630	12.192
821.29	1.397	0.0015333	15.825	12.176
822.37	1.397	0.0016853	17.416	12.160
823.45	1.397	0.0016694	17.275	12.144
824.54	1.397	0.0018218	18.877	12.128
825.63	1.397	0.0019617	20.353	12.112
826.72	1.396	0.0018808	19.539	12.096
827.81	1.396	0.0018444	19.186	12.080
828.91	1.396	0.0019872	20.699	12.064
830.01	1.396	0.0019871	20.726	12.048
831.12	1.396	0.0018067	18.869	12.032
832.22	1.396	0.0017681	18.491	12.016
833.33	1.396	0.0018068	18.921	12.000
834.45	1.396	0.0017760	18.623	11.984
835.56	1.396	0.0017217	18.078	11.968
836.68	1.396	0.0017889	18.809	11.952
837.80	1.396	0.0018343	19.312	11.936
838.93	1.396	0.0017871	18.840	11.920
840.05	1.397	0.0018641	19.678	11.904
841.18	1.396	0.0019650	20.771	11.888
842.32	1.396	0.0019519	20.661	11.872
843.45	1.396	0.0018224	19.316	11.856
844.59	1.396	0.0019369	20.557	11.840
845.74	1.396	0.0018338	19.489	11.824
846.88	1.396	0.0016637	17.705	11.808

NONANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
848.03	1.396	0.0015556	16.577	11.792
849.18	1.396	0.0015856	16.920	11.776
850.34	1.396	0.0015171	16.211	11.760
851.50	1.396	0.0013635	14.590	11.744
852.66	1.397	0.0013513	14.479	11.728
853.83	1.397	0.0013719	14.720	11.712
854.99	1.397	0.0012944	13.907	11.696
856.16	1.397	0.0012885	13.863	11.680
857.34	1.397	0.0013023	14.030	11.664
858.52	1.397	0.0012944	13.965	11.648
859.70	1.397	0.0012662	13.679	11.632
860.88	1.397	0.0012855	13.907	11.616
862.07	1.397	0.0013999	15.165	11.600
863.26	1.397	0.0014514	15.745	11.584
864.45	1.397	0.0014897	16.183	11.568
865.65	1.398	0.0016189	17.611	11.552
866.85	1.398	0.0018258	19.889	11.536
868.06	1.398	0.0019563	21.340	11.520
869.26	1.398	0.0019447	21.243	11.504
870.47	1.398	0.0020431	22.349	11.488
871.69	1.398	0.0022004	24.103	11.472
872.91	1.398	0.0022485	24.664	11.456
874.13	1.398	0.0022017	24.185	11.440
875.35	1.398	0.0021626	23.788	11.424
876.58	1.398	0.0023858	26.281	11.408
877.81	1.398	0.0025635	28.278	11.392
879.04	1.398	0.0026143	28.879	11.376
880.28	1.398	0.0026657	29.488	11.360
882.77	1.398	0.0028518	31.636	11.328
884.02	1.399	0.0035363	39.284	11.312
885.27	1.398	0.0042428	47.200	11.296
886.52	1.398	0.0044967	50.095	11.280
887.78	1.397	0.0048969	54.631	11.264
889.05	1.397	0.0050956	56.929	11.248
890.31	1.396	0.0048622	54.398	11.232
891.58	1.395	0.0045853	51.373	11.216
892.86	1.395	0.0043072	48.327	11.200
894.13	1.395	0.0037258	41.863	11.184
895.42	1.395	0.0032155	36.181	11.168
896.70	1.395	0.0027059	30.491	11.152
899.28	1.395	0.0025147	28.418	11.120
900.58	1.395	0.0021328	24.137	11.104
901.88	1.395	0.0018599	21.079	11.088
903.18	1.395	0.0017132	19.444	11.072
904.49	1.395	0.0016122	18.325	11.056
905.80	1.395	0.0014266	16.239	11.040
907.11	1.396	0.0013220	15.070	11.024
908.43	1.396	0.0013114	14.970	11.008
909.75	1.396	0.0013121	15.000	10.992
911.08	1.396	0.0012766	14.616	10.976
912.41	1.396	0.0012891	14.780	10.960
913.74	1.396	0.0013761	15.801	10.944
915.08	1.396	0.0014548	16.729	10.928
916.42	1.397	0.0014673	16.897	10.912
917.77	1.397	0.0015541	17.924	10.896
919.12	1.397	0.0016884	19.501	10.880

NONANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
920.47	1.397	0.0017566	20.318	10.864
921.83	1.397	0.0017820	20.643	10.848
923.19	1.397	0.0018449	21.403	10.832
924.56	1.397	0.0019048	22.131	10.816
925.93	1.396	0.0018328	21.326	10.800
927.30	1.396	0.0017228	20.075	10.784
928.68	1.396	0.0016604	19.377	10.768
930.06	1.396	0.0015599	18.231	10.752
931.45	1.397	0.0014209	16.631	10.736
937.03	1.397	0.0022985	27.065	10.672
939.85	1.397	0.0022942	27.096	10.640
941.27	1.397	0.0023373	27.646	10.624
942.68	1.396	0.0023502	27.841	10.608
946.97	1.396	0.0014908	17.741	10.560
948.41	1.397	0.0015333	18.274	10.544
949.85	1.397	0.0015969	19.061	10.528
951.29	1.397	0.0017214	20.578	10.512
954.20	1.397	0.0017493	20.975	10.480
955.66	1.397	0.0018159	21.807	10.464
958.59	1.397	0.0019335	23.291	10.432
960.06	1.397	0.0019475	23.495	10.416
961.54	1.397	0.0022387	27.050	10.400
964.51	1.397	0.0022875	27.725	10.368
966.00	1.397	0.0024054	29.199	10.352
967.49	1.397	0.0029186	35.484	10.336
970.50	1.396	0.0026769	32.647	10.304
972.01	1.396	0.0025211	30.794	10.288
976.56	1.396	0.0022135	27.164	10.240
978.09	1.396	0.0022411	27.545	10.224
979.62	1.396	0.0025735	31.680	10.208
981.16	1.396	0.0022740	28.038	10.192
985.80	1.396	0.0021968	27.214	10.144
987.36	1.396	0.0018864	23.406	10.128
990.49	1.396	0.0018276	22.748	10.096
992.06	1.396	0.0015691	19.561	10.080
993.64	1.396	0.0016222	20.255	10.064
995.22	1.396	0.0015885	19.866	10.048
996.81	1.396	0.0013306	16.667	10.032
998.40	1.396	0.0012501	15.684	10.016
1001.60	1.396	0.0011786	14.834	9.984
1004.82	1.396	0.0010741	13.563	9.952
1006.44	1.396	0.0011390	14.405	9.936
1008.06	1.396	0.0009962	12.620	9.920
1019.58	1.397	0.0009794	12.548	9.808
1024.59	1.397	0.0009787	12.601	9.760
1029.65	1.397	0.0010224	13.229	9.712
1031.35	1.398	0.0011753	15.232	9.696
1033.06	1.397	0.0013469	17.485	9.680
1034.77	1.398	0.0013270	17.255	9.664
1036.48	1.397	0.0014627	19.051	9.648
1046.90	1.397	0.0016093	21.171	9.552
1048.66	1.397	0.0015856	20.895	9.536
1050.42	1.398	0.0017607	23.241	9.520
1053.96	1.397	0.0017369	23.004	9.488
1061.12	1.397	0.0018958	25.279	9.424
1062.93	1.398	0.0019557	26.122	9.408

NONANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
1064.74	1.397	0.0021458	28.710	9.392
1068.38	1.397	0.0022516	30.229	9.360
1070.21	1.397	0.0021492	28.904	9.344
1072.04	1.397	0.0021453	28.901	9.328
1073.88	1.397	0.0017722	23.916	9.312
1075.73	1.397	0.0017701	23.928	9.296
1077.59	1.397	0.0019194	25.991	9.280
1081.31	1.397	0.0021176	28.774	9.248
1083.19	1.397	0.0022943	31.229	9.232
1085.07	1.397	0.0022924	31.258	9.216
1088.85	1.396	0.0024161	33.059	9.184
1090.75	1.396	0.0020793	28.500	9.168
1092.66	1.396	0.0019099	26.224	9.152
1094.57	1.396	0.0014362	19.755	9.136
1096.49	1.396	0.0010144	13.977	9.120
1098.42	1.396	0.0008796	12.141	9.104
1100.35	1.396	0.0008157	11.279	9.088
1102.29	1.397	0.0007452	10.323	9.072
1104.24	1.397	0.0006714	9.317	9.056
1106.19	1.397	0.0006399	8.895	9.040
1110.12	1.397	0.0006381	8.901	9.008
1114.08	1.397	0.0007309	10.233	8.976
1116.07	1.398	0.0007716	10.822	8.960
1118.07	1.398	0.0009148	12.853	8.944
1120.07	1.398	0.0010577	14.888	8.928
1126.13	1.398	0.0009485	13.422	8.880
1128.16	1.398	0.0009829	13.935	8.864
1130.20	1.398	0.0011834	16.807	8.848
1132.25	1.398	0.0016312	23.209	8.832
1134.30	1.398	0.0016468	23.473	8.816
1136.36	1.398	0.0017917	25.585	8.800
1138.43	1.398	0.0018989	27.166	8.784
1140.51	1.397	0.0018283	26.203	8.768
1142.60	1.397	0.0017940	25.759	8.752
1144.69	1.397	0.0015396	22.147	8.736
1146.79	1.397	0.0013010	18.749	8.720
1148.90	1.397	0.0011825	17.072	8.704
1151.01	1.397	0.0011010	15.925	8.688
1153.14	1.397	0.0010718	15.531	8.672
1155.27	1.398	0.0010977	15.936	8.656
1157.41	1.398	0.0010435	15.177	8.640
1159.55	1.398	0.0009828	14.321	8.624
1161.71	1.398	0.0009335	13.627	8.608
1163.87	1.398	0.0009013	13.182	8.592
1166.04	1.398	0.0008476	12.420	8.576
1170.41	1.398	0.0008263	12.153	8.544
1172.61	1.398	0.0008967	13.214	8.528
1174.81	1.398	0.0009294	13.721	8.512
1177.02	1.398	0.0010396	15.376	8.496
1179.25	1.398	0.0011701	17.340	8.480
1181.47	1.398	0.0012058	17.903	8.464
1183.71	1.398	0.0012350	18.371	8.448
1185.96	1.398	0.0013064	19.469	8.432
1188.21	1.398	0.0013362	19.951	8.416
1190.48	1.398	0.0011986	17.931	8.400
1192.75	1.398	0.0011127	16.678	8.384

NONANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
1195.03	1.398	0.0011144	16.735	8.368
1197.32	1.398	0.0010681	16.071	8.352
1199.62	1.399	0.0010219	15.405	8.336
1201.92	1.399	0.0010460	15.799	8.320
1204.24	1.399	0.0011238	17.007	8.304
1206.56	1.399	0.0011823	17.926	8.288
1208.90	1.399	0.0012469	18.943	8.272
1211.24	1.399	0.0013851	21.082	8.256
1213.59	1.399	0.0015067	22.978	8.240
1215.95	1.399	0.0014878	22.734	8.224
1218.32	1.399	0.0013032	19.952	8.208
1220.70	1.399	0.0011895	18.246	8.192
1223.09	1.399	0.0011463	17.618	8.176
1225.49	1.399	0.0011490	17.695	8.160
1227.90	1.399	0.0011308	17.449	8.144
1230.31	1.399	0.0011384	17.600	8.128
1232.74	1.399	0.0012071	18.699	8.112
1235.18	1.399	0.0012262	19.032	8.096
1237.62	1.400	0.0012923	20.098	8.080
1240.08	1.400	0.0016505	25.721	8.064
1242.54	1.400	0.0016849	26.309	8.048
1252.51	1.400	0.0015061	23.705	7.984
1255.02	1.400	0.0011605	18.302	7.968
1257.55	1.400	0.0011611	18.348	7.952
1260.08	1.400	0.0013794	21.842	7.936
1262.63	1.401	0.0014795	23.475	7.920
1265.18	1.401	0.0018072	28.732	7.904
1267.75	1.401	0.0022621	36.038	7.888
1270.33	1.401	0.0023999	38.311	7.872
1272.91	1.401	0.0025470	40.741	7.856
1275.51	1.400	0.0025496	40.866	7.840
1278.12	1.400	0.0022479	36.104	7.824
1280.74	1.401	0.0021459	34.536	7.808
1283.37	1.401	0.0024977	40.281	7.792
1286.01	1.401	0.0027216	43.982	7.776
1288.66	1.401	0.0030423	49.267	7.760
1291.32	1.401	0.0036682	59.525	7.744
1294.00	1.401	0.0040146	65.281	7.728
1299.38	1.400	0.0039743	64.894	7.696
1302.08	1.400	0.0034610	56.631	7.680
1304.80	1.400	0.0028359	46.499	7.664
1310.27	1.400	0.0028299	46.596	7.632
1313.03	1.401	0.0028159	46.462	7.616
1315.79	1.401	0.0028897	47.781	7.600
1318.57	1.401	0.0030217	50.068	7.584
1321.35	1.401	0.0028667	47.601	7.568
1324.15	1.401	0.0029669	49.368	7.552
1326.96	1.401	0.0031171	51.978	7.536
1329.79	1.401	0.0031178	52.100	7.520
1332.62	1.401	0.0030917	51.775	7.504
1335.47	1.402	0.0032957	55.308	7.488
1338.33	1.401	0.0033019	55.532	7.472
1341.20	1.402	0.0028743	48.443	7.456
1344.09	1.402	0.0025552	43.159	7.440
1346.98	1.403	0.0025066	42.428	7.424
1349.89	1.404	0.0027047	45.880	7.408

NONANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
1352.81	1.405	0.0031230	53.090	7.392
1355.75	1.405	0.0038221	65.117	7.376
1358.70	1.406	0.0049043	83.735	7.360
1361.66	1.407	0.0063723	109.037	7.344
1364.63	1.407	0.0087866	150.676	7.328
1367.61	1.407	0.0111146	191.014	7.312
1370.61	1.404	0.0146284	251.953	7.296
1373.63	1.399	0.0147019	253.778	7.280
1376.65	1.396	0.0116320	201.227	7.264
1379.69	1.395	0.0078204	135.588	7.248
1382.74	1.396	0.0053127	92.313	7.232
1385.81	1.398	0.0036948	64.343	7.216
1388.89	1.399	0.0036363	63.466	7.200
1391.98	1.400	0.0036646	64.101	7.184
1395.09	1.401	0.0035946	63.017	7.168
1398.21	1.402	0.0033539	58.929	7.152
1401.35	1.403	0.0031206	54.954	7.136
1404.49	1.404	0.0029547	52.149	7.120
1407.66	1.406	0.0034405	60.859	7.104
1410.84	1.407	0.0039720	70.421	7.088
1414.03	1.408	0.0047119	83.726	7.072
1417.23	1.409	0.0054028	96.220	7.056
1420.45	1.411	0.0059683	106.533	7.040
1423.69	1.415	0.0069135	123.686	7.024
1426.94	1.417	0.0142915	256.268	7.008
1430.21	1.415	0.0168513	302.861	6.992
1433.49	1.414	0.0192023	345.906	6.976
1436.78	1.415	0.0207508	374.658	6.960
1440.09	1.415	0.0246960	446.917	6.944
1443.42	1.415	0.0296566	537.928	6.928
1446.76	1.413	0.0349536	635.474	6.912
1450.12	1.409	0.0410636	748.292	6.896
1453.49	1.402	0.0487118	889.726	6.880
1456.88	1.390	0.0503829	922.394	6.864
1460.28	1.377	0.0473671	869.207	6.848
1467.14	1.363	0.0279254	514.851	6.816
1470.59	1.364	0.0170336	314.781	6.800
1474.06	1.368	0.0125496	232.464	6.784
1477.54	1.370	0.0106025	196.860	6.768
1481.04	1.372	0.0044973	83.700	6.752
1484.56	1.376	0.0036253	67.631	6.736
1488.10	1.378	0.0031590	59.074	6.720
1491.65	1.380	0.0028069	52.614	6.704
1495.22	1.381	0.0028463	53.481	6.688
1498.80	1.382	0.0025574	48.167	6.672
1502.40	1.383	0.0020720	39.118	6.656
1506.02	1.384	0.0015388	29.123	6.640
1513.32	1.385	0.0013933	26.497	6.608
1516.99	1.386	0.0014108	26.894	6.592
1524.39	1.387	0.0013883	26.595	6.560
1528.12	1.387	0.0010831	20.798	6.544
1531.86	1.387	0.0008997	17.320	6.528
1539.41	1.388	0.0008449	16.345	6.496
1550.87	1.389	0.0007446	14.511	6.448
1578.28	1.390	0.0006036	11.971	6.336
1582.28	1.390	0.0005631	11.197	6.320

NONANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
1586.29	1.391	0.0005424	10.813	6.304
1590.33	1.391	0.0005420	10.831	6.288
1594.39	1.391	0.0005185	10.388	6.272
1598.47	1.391	0.0004870	9.783	6.256
1602.56	1.391	0.0004667	9.399	6.240
1606.68	1.391	0.0004503	9.092	6.224
1610.82	1.391	0.0004239	8.580	6.208
1614.99	1.392	0.0004379	8.886	6.192
1619.17	1.392	0.0004376	8.903	6.176
1623.38	1.392	0.0004109	8.382	6.160
1627.60	1.392	0.0003871	7.918	6.144
1631.85	1.392	0.0003907	8.012	6.128
1649.08	1.392	0.0003826	7.928	6.064
1653.44	1.392	0.0003850	7.999	6.048
1657.82	1.393	0.0003862	8.045	6.032
1671.12	1.393	0.0003843	8.070	5.984
1684.64	1.393	0.0003887	8.228	5.936
1689.19	1.393	0.0003686	7.825	5.920
1693.77	1.393	0.0003325	7.077	5.904
1698.37	1.393	0.0003321	7.088	5.888
1707.65	1.393	0.0003311	7.105	5.856
1712.33	1.393	0.0003188	6.860	5.840
1717.03	1.393	0.0002954	6.374	5.824
1721.76	1.393	0.0002552	5.521	5.808
1726.52	1.393	0.0002423	5.258	5.792
1731.30	1.393	0.0002261	4.918	5.776
1736.11	1.393	0.0002097	4.574	5.760
1740.95	1.394	0.0002021	4.421	5.744
1745.81	1.394	0.0001867	4.096	5.728
1750.70	1.394	0.0001868	4.110	5.712
1755.62	1.394	0.0001854	4.090	5.696
1760.56	1.394	0.0001706	3.774	5.680
1765.54	1.394	0.0001848	4.099	5.664
1770.54	1.394	0.0001774	3.947	5.648
1775.57	1.394	0.0001769	3.948	5.632
1780.63	1.394	0.0001620	3.624	5.616
1785.71	1.394	0.0001570	3.524	5.600
1790.83	1.394	0.0001609	3.620	5.584
1795.98	1.394	0.0001471	3.319	5.568
1801.15	1.394	0.0001301	2.945	5.552
1816.86	1.394	0.0001267	2.893	5.504
1832.84	1.394	0.0001275	2.936	5.456
1838.24	1.394	0.0001190	2.749	5.440
1843.66	1.394	0.0001214	2.813	5.424
1849.11	1.395	0.0001241	2.883	5.408
1851.85	1.395	0.0001274	2.964	5.400
1854.60	1.395	0.0001295	3.018	5.392
1857.36	1.395	0.0001298	3.029	5.384
1860.12	1.395	0.0001372	3.207	5.376
1862.89	1.395	0.0001414	3.310	5.368
1865.67	1.395	0.0001429	3.351	5.360
1868.46	1.395	0.0001497	3.514	5.352
1871.26	1.395	0.0001537	3.615	5.344
1874.06	1.395	0.0001571	3.700	5.336
1876.88	1.395	0.0001581	3.728	5.328
1879.70	1.395	0.0001595	3.768	5.320

NONANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
1882.53	1.395	0.0001552	3.671	5.312
1885.37	1.395	0.0001527	3.618	5.304
1888.22	1.395	0.0001495	3.548	5.296
1891.07	1.395	0.0001396	3.317	5.288
1893.94	1.395	0.0001356	3.228	5.280
1896.81	1.395	0.0001372	3.270	5.272
1899.70	1.395	0.0001358	3.241	5.264
1902.59	1.395	0.0001350	3.228	5.256
1905.49	1.395	0.0001400	3.352	5.248
1908.40	1.395	0.0001459	3.499	5.240
1911.31	1.395	0.0001465	3.519	5.232
1914.24	1.395	0.0001467	3.529	5.224
1917.18	1.395	0.0001433	3.453	5.216
1920.12	1.395	0.0001425	3.439	5.208
1923.08	1.395	0.0001393	3.366	5.200
1926.04	1.395	0.0001325	3.207	5.192
1929.01	1.395	0.0001285	3.114	5.184
1931.99	1.395	0.0001212	2.942	5.176
1934.98	1.395	0.0001187	2.886	5.168
1937.98	1.395	0.0001167	2.842	5.160
1940.99	1.395	0.0001127	2.748	5.152
1944.01	1.395	0.0001099	2.684	5.144
1947.04	1.395	0.0001127	2.758	5.136
1950.08	1.395	0.0001110	2.721	5.128
1953.13	1.395	0.0001121	2.752	5.120
1956.18	1.395	0.0001159	2.848	5.112
1959.25	1.395	0.0001163	2.863	5.104
1962.32	1.395	0.0001148	2.832	5.096
1965.41	1.395	0.0001144	2.825	5.088
1968.50	1.395	0.0001165	2.882	5.080
1971.61	1.395	0.0001141	2.826	5.072
1974.72	1.395	0.0001120	2.780	5.064
1977.85	1.395	0.0001166	2.898	5.056
1980.98	1.395	0.0001161	2.891	5.048
1984.13	1.395	0.0001164	2.901	5.040
1987.28	1.395	0.0001202	3.002	5.032
1990.45	1.395	0.0001273	3.183	5.024
1993.62	1.395	0.0001343	3.364	5.016
1996.81	1.396	0.0001470	3.689	5.008
2000.00	1.396	0.0001575	3.959	5.000
2003.21	1.396	0.0001778	4.476	4.992
2006.42	1.396	0.0002000	5.043	4.984
2009.65	1.396	0.0002191	5.532	4.976
2012.88	1.396	0.0002456	6.212	4.968
2016.13	1.396	0.0002668	6.760	4.960
2019.39	1.396	0.0002801	7.108	4.952
2022.65	1.396	0.0002909	7.395	4.944
2025.93	1.396	0.0002902	7.387	4.936
2029.22	1.396	0.0002833	7.225	4.928
2032.52	1.396	0.0002735	6.985	4.920
2035.83	1.396	0.0002613	6.685	4.912
2039.15	1.396	0.0002451	6.280	4.904
2042.48	1.396	0.0002322	5.960	4.896
2045.83	1.396	0.0002227	5.726	4.888
2049.18	1.396	0.0002096	5.397	4.880
2052.55	1.396	0.0001956	5.044	4.872

NONANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
2055.92	1.396	0.0001890	4.882	4.864
2059.31	1.396	0.0001807	4.675	4.856
2062.71	1.396	0.0001700	4.407	4.848
2066.12	1.396	0.0001638	4.252	4.840
2069.54	1.396	0.0001591	4.138	4.832
2072.97	1.396	0.0001547	4.031	4.824
2076.41	1.396	0.0001514	3.951	4.816
2079.87	1.396	0.0001497	3.912	4.808
2083.33	1.396	0.0001498	3.923	4.800
2086.81	1.396	0.0001502	3.938	4.792
2090.30	1.396	0.0001495	3.927	4.784
2093.80	1.396	0.0001538	4.047	4.776
2097.32	1.396	0.0001580	4.164	4.768
2100.84	1.396	0.0001589	4.195	4.760
2104.38	1.396	0.0001604	4.242	4.752
2107.93	1.396	0.0001637	4.337	4.744
2111.49	1.396	0.0001653	4.386	4.736
2115.06	1.396	0.0001664	4.423	4.728
2118.64	1.396	0.0001688	4.493	4.720
2122.24	1.396	0.0001780	4.746	4.712
2125.85	1.396	0.0001849	4.940	4.704
2129.47	1.396	0.0001943	5.200	4.696
2133.11	1.396	0.0002093	5.611	4.688
2136.75	1.396	0.0002185	5.866	4.680
2140.41	1.396	0.0002302	6.193	4.672
2144.08	1.396	0.0002407	6.486	4.664
2147.77	1.396	0.0002467	6.659	4.656
2151.46	1.396	0.0002489	6.729	4.648
2155.17	1.396	0.0002517	6.816	4.640
2158.89	1.396	0.0002498	6.778	4.632
2162.63	1.396	0.0002475	6.727	4.624
2166.38	1.396	0.0002460	6.698	4.616
2170.14	1.396	0.0002476	6.753	4.608
2173.91	1.396	0.0002476	6.764	4.600
2177.70	1.396	0.0002489	6.810	4.592
2181.50	1.396	0.0002502	6.860	4.584
2185.31	1.396	0.0002536	6.964	4.576
2189.14	1.396	0.0002549	7.012	4.568
2192.98	1.396	0.0002536	6.989	4.560
2196.84	1.396	0.0002540	7.013	4.552
2200.70	1.397	0.0002530	6.997	4.544
2204.59	1.397	0.0002489	6.895	4.536
2208.48	1.397	0.0002466	6.843	4.528
2212.39	1.397	0.0002477	6.887	4.520
2216.31	1.397	0.0002519	7.015	4.512
2220.25	1.397	0.0002563	7.152	4.504
2224.20	1.397	0.0002583	7.220	4.496
2228.16	1.397	0.0002625	7.350	4.488
2232.14	1.397	0.0002650	7.434	4.480
2236.14	1.397	0.0002669	7.500	4.472
2240.14	1.397	0.0002698	7.595	4.464
2244.17	1.397	0.0002724	7.681	4.456
2248.20	1.397	0.0002752	7.776	4.448
2252.25	1.397	0.0002775	7.854	4.440
2256.32	1.397	0.0002812	7.972	4.432
2260.40	1.397	0.0002841	8.069	4.424

NONANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
2264.49	1.397	0.0002844	8.092	4.416
2268.60	1.397	0.0002873	8.191	4.408
2272.73	1.397	0.0002888	8.249	4.400
2276.87	1.397	0.0002890	8.269	4.392
2281.02	1.397	0.0002927	8.389	4.384
2285.19	1.397	0.0002991	8.590	4.376
2289.38	1.397	0.0003061	8.806	4.368
2293.58	1.397	0.0003125	9.008	4.360
2297.79	1.397	0.0003229	9.324	4.352
2302.03	1.397	0.0003339	9.659	4.344
2306.27	1.397	0.0003435	9.955	4.336
2310.54	1.397	0.0003527	10.241	4.328
2314.81	1.397	0.0003611	10.504	4.320
2319.11	1.397	0.0003719	10.837	4.312
2323.42	1.397	0.0003785	11.050	4.304
2327.75	1.397	0.0003902	11.415	4.296
2332.09	1.397	0.0003981	11.666	4.288
2336.45	1.397	0.0003923	11.517	4.280
2340.82	1.397	0.0003858	11.348	4.272
2345.22	1.397	0.0003843	11.326	4.264
2349.62	1.397	0.0003783	11.170	4.256
2354.05	1.397	0.0003636	10.757	4.248
2358.49	1.397	0.0003542	10.499	4.240
2362.95	1.398	0.0003473	10.314	4.232
2367.42	1.398	0.0003538	10.525	4.224
2371.92	1.398	0.0003442	10.258	4.216
2376.43	1.398	0.0003385	10.110	4.208
2380.95	1.398	0.0003362	10.059	4.200
2385.50	1.398	0.0003336	10.001	4.192
2390.06	1.398	0.0003340	10.030	4.184
2394.64	1.398	0.0003346	10.070	4.176
2399.23	1.398	0.0003310	9.980	4.168
2403.85	1.398	0.0003266	9.865	4.160
2408.48	1.398	0.0003251	9.840	4.152
2413.13	1.398	0.0003227	9.785	4.144
2417.79	1.398	0.0003181	9.666	4.136
2422.48	1.398	0.0003084	9.387	4.128
2427.18	1.398	0.0002974	9.072	4.120
2431.91	1.398	0.0002866	8.760	4.112
2436.65	1.398	0.0002741	8.394	4.104
2441.41	1.398	0.0002586	7.935	4.096
2446.18	1.398	0.0002455	7.548	4.088
2450.98	1.398	0.0002358	7.264	4.080
2455.80	1.398	0.0002275	7.022	4.072
2460.63	1.399	0.0002209	6.829	4.064
2465.48	1.399	0.0002202	6.823	4.056
2470.36	1.399	0.0002229	6.920	4.048
2475.25	1.399	0.0002303	7.162	4.040
2480.16	1.399	0.0002418	7.535	4.032
2485.09	1.399	0.0002567	8.015	4.024
2490.04	1.399	0.0002750	8.605	4.016
2495.01	1.399	0.0002956	9.268	4.008
2500.00	1.399	0.0003186	10.008	4.000
2505.01	1.399	0.0003617	11.387	3.992
2510.04	1.399	0.0003628	11.444	3.984
2515.09	1.399	0.0003808	12.034	3.976

NONANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
2520.16	1.400	0.0003998	12.661	3.968
2525.25	1.400	0.0004203	13.338	3.960
2530.36	1.400	0.0004381	13.930	3.952
2535.50	1.400	0.0004550	14.497	3.944
2540.65	1.400	0.0004770	15.229	3.936
2545.82	1.400	0.0004979	15.928	3.928
2551.02	1.400	0.0005313	17.032	3.920
2556.24	1.400	0.0005649	18.147	3.912
2561.48	1.400	0.0006065	19.522	3.904
2566.74	1.400	0.0006520	21.031	3.896
2577.32	1.401	0.0006738	21.823	3.880
2582.64	1.401	0.0007393	23.993	3.872
2587.99	1.401	0.0007977	25.941	3.864
2593.36	1.401	0.0008467	27.594	3.856
2598.75	1.401	0.0008858	28.928	3.848
2604.17	1.401	0.0009083	29.725	3.840
2609.60	1.401	0.0009508	31.179	3.832
2615.06	1.401	0.0009907	32.556	3.824
2620.55	1.402	0.0010086	33.215	3.816
2626.05	1.402	0.0010485	34.602	3.808
2631.58	1.402	0.0011159	36.903	3.800
2637.13	1.402	0.0011842	39.245	3.792
2642.71	1.402	0.0012533	41.620	3.784
2648.31	1.402	0.0013151	43.767	3.776
2653.93	1.402	0.0013755	45.872	3.768
2659.57	1.402	0.0014219	47.522	3.760
2665.25	1.403	0.0014420	48.296	3.752
2670.94	1.403	0.0014198	47.654	3.744
2676.66	1.403	0.0013715	46.130	3.736
2682.40	1.403	0.0013397	45.157	3.728
2688.17	1.403	0.0013341	45.068	3.720
2693.97	1.404	0.0013470	45.599	3.712
2699.78	1.404	0.0013655	46.325	3.704
2705.63	1.404	0.0014217	48.339	3.696
2711.50	1.405	0.0015198	51.784	3.688
2717.39	1.405	0.0016053	54.816	3.680
2723.31	1.405	0.0016284	55.727	3.672
2729.26	1.406	0.0016434	56.365	3.664
2735.23	1.406	0.0015796	54.293	3.656
2741.23	1.407	0.0015745	54.237	3.648
2747.25	1.407	0.0015493	53.486	3.640
2753.30	1.408	0.0015741	54.461	3.632
2759.38	1.409	0.0016564	57.438	3.624
2765.49	1.410	0.0018489	64.255	3.616
2771.62	1.411	0.0021412	74.578	3.608
2777.78	1.412	0.0025312	88.354	3.600
2783.96	1.413	0.0029580	103.484	3.592
2790.18	1.414	0.0034654	121.504	3.584
2796.42	1.415	0.0040069	140.807	3.576
2802.69	1.417	0.0046885	165.128	3.568
2808.99	1.418	0.0053886	190.212	3.560
2815.32	1.421	0.0056699	200.592	3.552
2821.67	1.425	0.0089598	317.698	3.544
2828.05	1.428	0.0132669	471.482	3.536
2834.47	1.429	0.0193230	688.267	3.528
2840.91	1.428	0.0241907	863.608	3.520

NONANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
2847.38	1.427	0.0297516	1064.550	3.512
2853.88	1.423	0.0341149	1223.461	3.504
2860.41	1.419	0.0364206	1309.136	3.496
2866.97	1.415	0.0372459	1341.874	3.488
2873.56	1.412	0.0367412	1326.732	3.480
2880.18	1.412	0.0367917	1331.616	3.472
2886.84	1.412	0.0389333	1412.388	3.464
2893.52	1.412	0.0411575	1496.528	3.456
2900.23	1.412	0.0466901	1701.639	3.448
2906.98	1.408	0.0536979	1961.593	3.440
2913.75	1.401	0.0614465	2249.879	3.432
2920.56	1.388	0.0652031	2393.008	3.424
2927.40	1.373	0.0609311	2241.460	3.416
2934.27	1.363	0.0518475	1911.779	3.408
2941.18	1.357	0.0414513	1532.040	3.400
2948.11	1.355	0.0319655	1184.227	3.392
2955.08	1.355	0.0243848	905.521	3.384
2962.09	1.357	0.0173338	645.211	3.376
2969.12	1.359	0.0120380	449.152	3.368
2976.19	1.363	0.0078091	292.060	3.360
2983.29	1.366	0.0055989	209.898	3.352
2990.43	1.369	0.0045279	170.153	3.344
2997.60	1.371	0.0037931	142.882	3.336
3004.81	1.373	0.0031495	118.924	3.328
3012.05	1.375	0.0026577	100.597	3.320
3019.32	1.376	0.0022441	85.144	3.312
3026.63	1.377	0.0018912	71.931	3.304
3033.98	1.378	0.0015966	60.873	3.296
3041.36	1.379	0.0013415	51.269	3.288
3048.78	1.380	0.0012389	47.465	3.280
3056.23	1.381	0.0010780	41.401	3.272
3063.73	1.381	0.0009529	36.687	3.264
3071.25	1.382	0.0008494	32.782	3.256
3078.82	1.382	0.0007531	29.137	3.248
3086.42	1.383	0.0006920	26.840	3.240
3094.06	1.383	0.0006320	24.574	3.232
3101.74	1.384	0.0005865	22.860	3.224
3109.45	1.384	0.0005449	21.291	3.216
3117.21	1.385	0.0005274	20.658	3.208
3125.00	1.385	0.0005100	20.029	3.200
3132.83	1.385	0.0004884	19.228	3.192
3140.70	1.386	0.0004779	18.863	3.184
3148.61	1.386	0.0004672	18.484	3.176
3156.57	1.386	0.0004575	18.148	3.168
3164.56	1.386	0.0004420	17.578	3.160
3188.78	1.387	0.0004250	17.032	3.136
3196.93	1.387	0.0003825	15.367	3.128
3205.13	1.387	0.0003321	13.376	3.120
3213.37	1.388	0.0002924	11.809	3.112
3221.65	1.388	0.0002559	10.361	3.104
3229.97	1.388	0.0002232	9.060	3.096
3238.34	1.388	0.0001998	8.130	3.088
3246.75	1.388	0.0001802	7.353	3.080
3255.21	1.388	0.0001645	6.730	3.072
3263.71	1.389	0.0001501	6.154	3.064
3272.25	1.389	0.0001417	5.828	3.056

NONANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
3280.84	1.389	0.0001374	5.665	3.048
3289.47	1.389	0.0001339	5.534	3.040
3298.15	1.389	0.0001304	5.406	3.032
3306.88	1.389	0.0001293	5.374	3.024
3315.65	1.389	0.0001309	5.455	3.016
3324.47	1.390	0.0001332	5.566	3.008
3333.33	1.390	0.0001339	5.609	3.000
3342.25	1.390	0.0001338	5.618	2.992
3351.21	1.390	0.0001348	5.678	2.984
3360.22	1.390	0.0001324	5.589	2.976
3369.27	1.390	0.0001298	5.497	2.968
3378.38	1.390	0.0001252	5.314	2.960
3387.53	1.390	0.0001215	5.170	2.952
3396.74	1.390	0.0001158	4.945	2.944
3405.99	1.390	0.0001089	4.661	2.936
3415.30	1.390	0.0001019	4.373	2.928
3424.66	1.391	0.0000927	3.991	2.920
3434.07	1.391	0.0000863	3.725	2.912
3443.53	1.391	0.0000785	3.398	2.904
3453.04	1.391	0.0000705	3.060	2.896
3462.60	1.391	0.0000650	2.830	2.888
3472.22	1.391	0.0000588	2.567	2.880
3481.89	1.391	0.0000542	2.372	2.872
3491.62	1.391	0.0000526	2.309	2.864
3501.40	1.391	0.0000525	2.309	2.856
3511.24	1.391	0.0000544	2.400	2.848
3521.13	1.391	0.0000571	2.527	2.840
3531.07	1.391	0.0000640	2.838	2.832
3541.08	1.391	0.0000742	3.303	2.824
3551.14	1.391	0.0000888	3.961	2.816
3561.25	1.392	0.0001052	4.708	2.808
3571.43	1.392	0.0001212	5.440	2.800
3581.66	1.392	0.0001437	6.467	2.792
3591.95	1.392	0.0001635	7.380	2.784
3602.31	1.392	0.0001788	8.093	2.776
3612.72	1.392	0.0001909	8.667	2.768
3623.19	1.392	0.0001985	9.038	2.760
3633.72	1.392	0.0001993	9.102	2.752
3644.31	1.392	0.0001969	9.019	2.744
3654.97	1.392	0.0001938	8.899	2.736
3665.69	1.392	0.0001910	8.800	2.728
3676.47	1.392	0.0001883	8.698	2.720
3687.32	1.392	0.0001833	8.494	2.712
3698.22	1.392	0.0001829	8.500	2.704
3709.20	1.392	0.0001846	8.606	2.696
3720.24	1.392	0.0001856	8.677	2.688
3731.34	1.392	0.0001886	8.841	2.680
3742.51	1.392	0.0001922	9.041	2.672
3753.75	1.392	0.0001951	9.201	2.664
3765.06	1.392	0.0001979	9.363	2.656
3776.44	1.392	0.0001997	9.477	2.648
3787.88	1.392	0.0002105	10.021	2.640
3799.39	1.392	0.0002052	9.799	2.632
3810.98	1.392	0.0002076	9.944	2.624
3822.63	1.392	0.0002097	10.071	2.616
3834.36	1.393	0.0002095	10.094	2.608

NONANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
3846.15	1.393	0.0002107	10.183	2.600
3858.02	1.393	0.0002107	10.213	2.592
3869.97	1.393	0.0002096	10.193	2.584
3881.99	1.393	0.0002126	10.370	2.576
3894.08	1.393	0.0002212	10.826	2.568
3906.25	1.393	0.0002229	10.943	2.560
4000.00	1.393	0.0003277	16.470	2.500
4090.00	1.393	0.0005457	28.047	2.445
4336.00	1.393	0.0007183	39.141	2.306
4390.00	1.393	0.0003991	22.017	2.278
4444.00	1.393	0.0002245	12.535	2.250
4615.00	1.393	0.0000526	3.053	2.167
4864.00	1.394	0.0000131	0.803	2.056
5000.00	1.394	0.0000128	0.803	2.000

DECANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
666.00	1.408	0.0000478	0.400	15.015
678.00	1.409	0.0001182	1.007	14.749
695.00	1.412	0.0014770	12.900	14.388
702.00	1.414	0.0033475	29.530	14.245
709.00	1.417	0.0059442	52.960	14.104
713.00	1.420	0.0103830	93.030	14.025
714.29	1.420	0.0127303	114.268	14.000
715.10	1.420	0.0139173	125.064	13.984
715.92	1.420	0.0140425	126.334	13.968
716.74	1.423	0.0170315	153.400	13.952
717.57	1.421	0.0231094	208.383	13.936
718.39	1.417	0.0244624	220.836	13.920
720.05	1.414	0.0244383	221.128	13.888
720.88	1.412	0.0306834	277.956	13.872
721.71	1.403	0.0311721	282.708	13.856
722.54	1.399	0.0239344	217.317	13.840
723.38	1.400	0.0222098	201.893	13.824
725.06	1.399	0.0192271	175.185	13.792
726.74	1.397	0.0176611	161.290	13.760
727.59	1.397	0.0161808	147.944	13.744
728.44	1.397	0.0147165	134.712	13.728
730.14	1.397	0.0149862	137.502	13.696
730.99	1.396	0.0132622	121.825	13.680
731.85	1.397	0.0121675	111.901	13.664
733.57	1.397	0.0119762	110.400	13.632
735.29	1.396	0.0108065	99.852	13.600
736.16	1.396	0.0097772	90.447	13.584
737.03	1.397	0.0097176	90.002	13.568
739.65	1.396	0.0094240	87.593	13.520
740.52	1.395	0.0082992	77.229	13.504
741.40	1.396	0.0075621	70.454	13.488
742.28	1.396	0.0075477	70.404	13.472
744.05	1.395	0.0072624	67.903	13.440
744.93	1.395	0.0055185	51.659	13.424
745.82	1.396	0.0046985	44.036	13.408
747.61	1.397	0.0040714	38.250	13.376
748.50	1.397	0.0039817	37.451	13.360
749.40	1.397	0.0034465	32.457	13.344
751.20	1.398	0.0032953	31.107	13.312
752.11	1.399	0.0032367	30.591	13.296
753.92	1.399	0.0031231	29.589	13.264
754.83	1.400	0.0031367	29.753	13.248
755.74	1.400	0.0031320	29.744	13.232
757.58	1.401	0.0031568	30.053	13.200
758.50	1.401	0.0036726	35.006	13.184
759.42	1.401	0.0037689	35.967	13.168
761.27	1.401	0.0040210	38.467	13.136
762.20	1.401	0.0046215	44.265	13.120
763.13	1.401	0.0045671	43.798	13.104
764.06	1.401	0.0046156	44.317	13.088
764.99	1.401	0.0048786	46.899	13.072
765.93	1.400	0.0051794	49.851	13.056
766.87	1.400	0.0051669	49.792	13.040

DECANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
767.81	1.399	0.0047517	45.847	13.024
768.76	1.400	0.0043065	41.603	13.008
769.70	1.400	0.0045931	44.426	12.992
772.56	1.399	0.0042449	41.210	12.944
773.51	1.399	0.0036926	35.893	12.928
775.43	1.399	0.0034110	33.238	12.896
776.40	1.399	0.0027886	27.207	12.880
777.36	1.399	0.0029152	28.478	12.864
778.33	1.399	0.0028521	27.896	12.848
779.30	1.399	0.0023740	23.249	12.832
781.25	1.399	0.0022455	22.045	12.800
782.23	1.400	0.0019786	19.449	12.784
784.19	1.400	0.0019922	19.632	12.752
785.18	1.400	0.0019555	19.294	12.736
788.15	1.400	0.0019352	19.166	12.688
789.14	1.400	0.0019038	18.880	12.672
791.14	1.401	0.0017770	17.667	12.640
794.16	1.401	0.0016458	16.425	12.592
795.17	1.401	0.0016450	16.438	12.576
797.19	1.401	0.0016327	16.356	12.544
800.26	1.401	0.0015885	15.975	12.496
803.34	1.401	0.0015880	16.031	12.448
806.45	1.401	0.0015669	15.879	12.400
807.49	1.401	0.0015436	15.664	12.384
809.59	1.402	0.0016193	16.474	12.352
810.64	1.401	0.0016495	16.804	12.336
811.69	1.401	0.0015356	15.663	12.320
812.74	1.402	0.0015088	15.409	12.304
814.86	1.401	0.0015014	15.374	12.272
815.93	1.401	0.0013712	14.060	12.256
816.99	1.402	0.0013371	13.727	12.240
818.06	1.402	0.0012920	13.282	12.224
819.14	1.402	0.0011420	11.755	12.208
820.21	1.402	0.0011153	11.495	12.192
821.29	1.402	0.0011097	11.452	12.176
824.54	1.402	0.0010693	11.079	12.128
827.81	1.402	0.0010855	11.292	12.080
828.91	1.402	0.0011802	12.293	12.064
830.01	1.402	0.0011568	12.066	12.048
831.12	1.403	0.0011761	12.284	12.032
832.22	1.403	0.0013029	13.626	12.016
833.33	1.403	0.0013223	13.847	12.000
834.45	1.403	0.0013124	13.762	11.984
835.56	1.403	0.0014678	15.412	11.968
836.68	1.403	0.0014507	15.253	11.952
837.80	1.403	0.0014271	15.025	11.936
838.93	1.403	0.0015257	16.085	11.920
840.05	1.403	0.0016055	16.949	11.904
841.18	1.403	0.0014940	15.793	11.888
842.32	1.403	0.0014951	15.825	11.872
843.45	1.403	0.0016305	17.281	11.856
844.59	1.403	0.0015891	16.866	11.840
845.74	1.403	0.0015134	16.085	11.824
846.88	1.403	0.0015591	16.592	11.808
848.03	1.403	0.0015515	16.534	11.792
849.18	1.403	0.0014899	15.899	11.776

DECANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
850.34	1.403	0.0014888	15.909	11.760
851.50	1.403	0.0015082	16.138	11.744
852.66	1.403	0.0014682	15.732	11.728
854.99	1.403	0.0014864	15.970	11.696
856.16	1.403	0.0014612	15.721	11.680
858.52	1.403	0.0014055	15.164	11.648
859.70	1.403	0.0014544	15.712	11.632
862.07	1.403	0.0014096	15.270	11.600
863.26	1.403	0.0014673	15.918	11.584
864.45	1.403	0.0014486	15.736	11.568
865.65	1.403	0.0014839	16.142	11.552
866.85	1.403	0.0016094	17.532	11.536
868.06	1.403	0.0015999	17.452	11.520
869.26	1.403	0.0015838	17.301	11.504
870.47	1.404	0.0017221	18.837	11.488
872.91	1.404	0.0017883	19.616	11.456
874.13	1.404	0.0018874	20.733	11.440
875.35	1.404	0.0020221	22.243	11.424
876.58	1.404	0.0020453	22.530	11.408
879.04	1.404	0.0021073	23.278	11.376
880.28	1.404	0.0022305	24.674	11.360
882.77	1.404	0.0022457	24.912	11.328
884.02	1.404	0.0024519	27.239	11.312
885.27	1.404	0.0026521	29.504	11.296
886.52	1.404	0.0030007	33.429	11.280
887.78	1.404	0.0029031	32.388	11.264
889.05	1.404	0.0031185	34.841	11.248
890.31	1.404	0.0035350	39.549	11.232
891.58	1.403	0.0035309	39.560	11.216
894.13	1.403	0.0034924	39.240	11.184
896.70	1.402	0.0034083	38.406	11.152
899.28	1.402	0.0031472	35.566	11.120
900.58	1.402	0.0030313	34.305	11.104
901.88	1.402	0.0028004	31.738	11.088
903.18	1.402	0.0024693	28.025	11.072
904.49	1.402	0.0022902	26.030	11.056
905.80	1.402	0.0023105	26.300	11.040
907.11	1.402	0.0022216	25.324	11.024
908.43	1.402	0.0021236	24.243	11.008
909.75	1.402	0.0021149	24.178	10.992
911.08	1.403	0.0022743	26.039	10.976
912.41	1.403	0.0023252	26.660	10.960
913.74	1.403	0.0023237	26.682	10.944
915.08	1.403	0.0024580	28.265	10.928
919.12	1.402	0.0025373	29.305	10.880
920.47	1.402	0.0025332	29.302	10.864
923.19	1.402	0.0025381	29.445	10.832
924.56	1.402	0.0023915	27.786	10.816
925.93	1.402	0.0023783	27.673	10.800
928.68	1.402	0.0023539	27.470	10.768
930.06	1.402	0.0021916	25.615	10.752
931.45	1.402	0.0022543	26.387	10.736
932.84	1.402	0.0020560	24.102	10.720
934.23	1.402	0.0019641	23.058	10.704
935.63	1.402	0.0019241	22.623	10.688
937.03	1.402	0.0017665	20.800	10.672

DECANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
938.44	1.402	0.0016554	19.522	10.656
939.85	1.402	0.0016100	19.015	10.640
941.27	1.402	0.0015398	18.213	10.624
942.68	1.402	0.0014345	16.993	10.608
944.11	1.402	0.0014357	17.033	10.592
945.54	1.402	0.0014411	17.123	10.576
948.41	1.402	0.0013890	16.554	10.544
949.85	1.402	0.0013608	16.243	10.528
951.29	1.402	0.0013008	15.550	10.512
952.74	1.402	0.0012851	15.386	10.496
954.20	1.402	0.0012690	15.216	10.480
955.66	1.402	0.0012101	14.532	10.464
957.12	1.402	0.0011627	13.985	10.448
958.59	1.402	0.0011635	14.016	10.432
960.06	1.402	0.0011344	13.686	10.416
968.99	1.403	0.0011357	13.829	10.320
972.01	1.403	0.0011189	13.668	10.288
975.04	1.403	0.0011857	14.529	10.256
978.09	1.403	0.0011770	14.467	10.224
981.16	1.403	0.0011997	14.792	10.192
984.25	1.403	0.0012996	16.075	10.160
987.36	1.403	0.0013214	16.395	10.128
988.92	1.403	0.0013699	17.024	10.112
993.64	1.403	0.0013793	17.222	10.064
998.40	1.403	0.0013647	17.121	10.016
1001.60	1.403	0.0013676	17.214	9.984
1006.44	1.403	0.0013926	17.612	9.936
1008.07	1.403	0.0013716	17.375	9.920
1009.69	1.403	0.0013157	16.694	9.904
1011.33	1.403	0.0012753	16.208	9.888
1014.61	1.403	0.0012396	15.804	9.856
1016.26	1.403	0.0011954	15.266	9.840
1019.58	1.403	0.0012342	15.813	9.808
1022.91	1.403	0.0012206	15.689	9.776
1024.59	1.403	0.0011662	15.016	9.760
1026.27	1.403	0.0011791	15.206	9.744
1034.77	1.404	0.0012859	16.721	9.664
1038.21	1.404	0.0012783	16.678	9.632
1039.93	1.404	0.0014120	18.453	9.616
1041.67	1.404	0.0014275	18.686	9.600
1045.15	1.404	0.0014322	18.810	9.568
1046.90	1.404	0.0014413	18.961	9.552
1048.66	1.404	0.0014254	18.783	9.536
1050.42	1.404	0.0016354	21.587	9.520
1052.19	1.404	0.0016296	21.547	9.504
1053.96	1.404	0.0016517	21.877	9.488
1055.74	1.404	0.0017769	23.574	9.472
1059.32	1.404	0.0019901	26.491	9.440
1061.12	1.404	0.0019361	25.817	9.424
1062.93	1.404	0.0020652	27.585	9.408
1064.74	1.404	0.0020639	27.614	9.392
1068.38	1.404	0.0022859	30.690	9.360
1072.04	1.404	0.0022261	29.989	9.328
1073.88	1.404	0.0023544	31.772	9.312
1079.45	1.404	0.0023444	31.801	9.264
1081.32	1.404	0.0028291	38.443	9.248

DECANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
1083.19	1.404	0.0029893	40.689	9.232
1090.75	1.402	0.0031067	42.582	9.168
1092.66	1.402	0.0022467	30.849	9.152
1094.57	1.402	0.0020868	28.704	9.136
1096.49	1.402	0.0016612	22.889	9.120
1098.42	1.402	0.0012454	17.190	9.104
1100.35	1.402	0.0010104	13.971	9.088
1102.29	1.402	0.0009105	12.613	9.072
1104.24	1.403	0.0008035	11.149	9.056
1106.20	1.403	0.0007043	9.791	9.040
1110.12	1.403	0.0006644	9.268	9.008
1112.10	1.403	0.0006667	9.318	8.992
1114.08	1.403	0.0006735	9.429	8.976
1116.07	1.404	0.0007206	10.107	8.960
1118.07	1.404	0.0008277	11.630	8.944
1120.07	1.404	0.0009963	14.024	8.928
1122.08	1.404	0.0011477	16.183	8.912
1124.10	1.404	0.0013236	18.697	8.896
1126.13	1.404	0.0015621	22.105	8.880
1128.16	1.404	0.0019122	27.108	8.864
1130.20	1.404	0.0020676	29.366	8.848
1132.25	1.403	0.0019078	27.145	8.832
1134.30	1.403	0.0016709	23.817	8.816
1136.36	1.403	0.0016246	23.200	8.800
1138.43	1.403	0.0014544	20.807	8.784
1140.51	1.403	0.0013278	19.030	8.768
1142.60	1.403	0.0012710	18.249	8.752
1144.69	1.403	0.0012060	17.347	8.736
1146.79	1.403	0.0010473	15.092	8.720
1148.90	1.403	0.0009258	13.367	8.704
1151.01	1.404	0.0008980	12.988	8.688
1153.14	1.404	0.0008902	12.900	8.672
1155.27	1.404	0.0008313	12.068	8.656
1159.56	1.404	0.0008188	11.932	8.624
1163.87	1.404	0.0008146	11.914	8.592
1166.05	1.404	0.0008123	11.903	8.576
1168.22	1.404	0.0008611	12.641	8.560
1170.41	1.404	0.0009822	14.446	8.544
1172.61	1.404	0.0010547	15.541	8.528
1174.81	1.404	0.0011146	16.456	8.512
1177.02	1.404	0.0012233	18.094	8.496
1179.25	1.404	0.0013280	19.680	8.480
1181.47	1.404	0.0013452	19.971	8.464
1183.71	1.404	0.0012795	19.032	8.448
1185.96	1.404	0.0012573	18.738	8.432
1188.21	1.404	0.0012330	18.411	8.416
1190.48	1.404	0.0011247	16.825	8.400
1192.75	1.404	0.0010799	16.186	8.384
1195.03	1.405	0.0011164	16.766	8.368
1197.32	1.405	0.0011140	16.762	8.352
1199.62	1.405	0.0011587	17.468	8.336
1201.92	1.405	0.0012833	19.383	8.320
1204.24	1.405	0.0013071	19.781	8.304
1206.56	1.405	0.0013273	20.124	8.288
1211.24	1.405	0.0012639	19.238	8.256
1213.59	1.405	0.0011600	17.691	8.240

DECANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
1215.95	1.405	0.0011156	17.046	8.224
1218.32	1.405	0.0011012	16.859	8.208
1220.70	1.405	0.0010812	16.586	8.192
1223.09	1.405	0.0011465	17.622	8.176
1225.49	1.405	0.0012616	19.429	8.160
1227.90	1.405	0.0013433	20.727	8.144
1230.32	1.405	0.0013281	20.533	8.128
1232.74	1.406	0.0014061	21.782	8.112
1235.18	1.406	0.0015568	24.164	8.096
1237.62	1.406	0.0016580	25.787	8.080
1240.08	1.406	0.0016832	26.230	8.064
1242.55	1.406	0.0018338	28.633	8.048
1245.02	1.406	0.0020231	31.653	8.032
1247.51	1.405	0.0019775	31.001	8.016
1250.00	1.405	0.0017432	27.382	8.000
1252.51	1.405	0.0011536	18.158	7.984
1255.02	1.406	0.0008411	13.265	7.968
1257.55	1.406	0.0008780	13.876	7.952
1260.08	1.407	0.0012219	19.348	7.936
1262.63	1.407	0.0017310	27.464	7.920
1265.18	1.407	0.0023286	37.021	7.904
1267.75	1.407	0.0028571	45.517	7.888
1270.33	1.406	0.0029247	46.688	7.872
1272.91	1.406	0.0027440	43.892	7.856
1275.51	1.406	0.0023633	37.880	7.840
1278.12	1.406	0.0020089	32.266	7.824
1280.74	1.407	0.0019087	30.719	7.808
1283.37	1.407	0.0022800	36.770	7.792
1286.01	1.408	0.0027902	45.091	7.776
1288.66	1.408	0.0032695	52.946	7.760
1291.32	1.407	0.0037201	60.366	7.744
1294.00	1.407	0.0040877	66.469	7.728
1296.68	1.406	0.0042277	68.889	7.712
1299.38	1.406	0.0040393	65.956	7.696
1302.08	1.406	0.0035938	58.804	7.680
1304.80	1.406	0.0031756	52.068	7.664
1307.53	1.406	0.0026323	43.251	7.648
1310.27	1.407	0.0026714	43.986	7.632
1313.03	1.407	0.0028256	46.622	7.616
1315.79	1.407	0.0030364	50.206	7.600
1318.57	1.407	0.0032774	54.306	7.584
1321.35	1.407	0.0035091	58.268	7.568
1324.15	1.407	0.0035576	59.198	7.552
1326.96	1.407	0.0034676	57.822	7.536
1329.79	1.407	0.0033290	55.630	7.520
1332.62	1.407	0.0032446	54.335	7.504
1335.47	1.407	0.0032277	54.168	7.488
1338.33	1.407	0.0031048	52.216	7.472
1341.20	1.408	0.0026195	44.150	7.456
1346.98	1.409	0.0027689	46.869	7.424
1349.89	1.410	0.0032935	55.868	7.408
1352.81	1.410	0.0037172	63.192	7.392
1355.75	1.411	0.0043637	74.343	7.376
1358.70	1.412	0.0054628	93.271	7.360
1361.66	1.412	0.0070079	119.914	7.344
1364.63	1.412	0.0089449	153.391	7.328

DECANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
1367.62	1.411	0.0111186	191.084	7.312
1370.61	1.409	0.0130743	225.186	7.296
1373.63	1.406	0.0133568	230.560	7.280
1376.65	1.402	0.0110799	191.676	7.264
1379.69	1.401	0.0075250	130.466	7.248
1382.74	1.403	0.0049003	85.148	7.232
1385.81	1.404	0.0041002	71.404	7.216
1388.89	1.405	0.0043269	75.519	7.200
1391.98	1.406	0.0033545	58.678	7.184
1395.09	1.407	0.0034181	59.924	7.168
1398.21	1.408	0.0033089	58.139	7.152
1401.35	1.409	0.0029883	52.624	7.136
1404.49	1.410	0.0026944	47.555	7.120
1407.66	1.412	0.0028537	50.480	7.104
1410.84	1.413	0.0031359	55.598	7.088
1414.03	1.415	0.0037863	67.279	7.072
1417.23	1.419	0.0045120	80.356	7.056
1420.46	1.420	0.0103104	184.041	7.040
1423.69	1.419	0.0115730	207.048	7.024
1426.94	1.420	0.0140121	251.257	7.008
1430.21	1.420	0.0162021	291.192	6.992
1433.49	1.420	0.0191757	345.427	6.976
1436.78	1.420	0.0215443	388.985	6.960
1440.09	1.419	0.0247080	447.133	6.944
1443.42	1.419	0.0284869	516.710	6.928
1446.76	1.418	0.0331616	602.895	6.912
1450.12	1.415	0.0405248	738.472	6.896
1453.49	1.407	0.0458197	836.902	6.880
1456.88	1.397	0.0485001	887.925	6.864
1460.28	1.385	0.0481942	884.383	6.848
1463.70	1.374	0.0400019	735.772	6.832
1467.14	1.369	0.0285120	525.664	6.816
1470.59	1.369	0.0187990	347.404	6.800
1474.06	1.371	0.0116535	215.864	6.784
1477.54	1.375	0.0060158	111.697	6.768
1481.04	1.380	0.0042283	78.693	6.752
1484.56	1.383	0.0034044	63.512	6.736
1491.65	1.386	0.0026741	50.125	6.704
1495.22	1.388	0.0026344	49.499	6.688
1498.80	1.388	0.0025432	47.900	6.672
1502.40	1.389	0.0020291	38.308	6.656
1516.99	1.392	0.0014905	28.414	6.592
1520.68	1.392	0.0014698	28.088	6.576
1524.39	1.392	0.0012741	24.406	6.560
1528.12	1.393	0.0009913	19.035	6.544
1531.86	1.393	0.0007882	15.174	6.528
1550.87	1.395	0.0006884	13.415	6.448
1570.35	1.396	0.0006438	12.704	6.368
1574.31	1.396	0.0006109	12.087	6.352
1578.28	1.396	0.0005910	11.721	6.336
1582.28	1.397	0.0005523	10.981	6.320
1586.29	1.397	0.0005266	10.497	6.304
1590.33	1.397	0.0005230	10.452	6.288
1594.39	1.397	0.0005014	10.046	6.272
1598.47	1.397	0.0004740	9.521	6.256
1602.56	1.397	0.0004490	9.042	6.240

DECANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
1606.68	1.397	0.0004377	8.838	6.224
1610.83	1.397	0.0004240	8.584	6.208
1614.99	1.398	0.0004150	8.423	6.192
1619.17	1.398	0.0004013	8.165	6.176
1623.38	1.398	0.0003849	7.852	6.160
1631.85	1.398	0.0003828	7.850	6.128
1636.13	1.398	0.0003682	7.569	6.112
1644.74	1.398	0.0003661	7.567	6.080
1653.44	1.398	0.0003619	7.520	6.048
1666.67	1.399	0.0003676	7.699	6.000
1671.12	1.399	0.0003627	7.617	5.984
1675.60	1.399	0.0003537	7.448	5.968
1680.11	1.399	0.0003565	7.526	5.952
1689.19	1.399	0.0003525	7.483	5.920
1693.77	1.399	0.0003102	6.603	5.904
1698.37	1.399	0.0003009	6.422	5.888
1707.65	1.399	0.0002731	5.861	5.856
1712.33	1.399	0.0002375	5.110	5.840
1717.03	1.399	0.0002275	4.909	5.824
1721.76	1.399	0.0002238	4.843	5.808
1726.52	1.399	0.0002134	4.629	5.792
1731.30	1.399	0.0002049	4.458	5.776
1736.11	1.400	0.0002038	4.447	5.760
1740.95	1.400	0.0001854	4.055	5.744
1745.81	1.400	0.0001796	3.939	5.728
1750.70	1.400	0.0001737	3.821	5.712
1755.62	1.400	0.0001725	3.806	5.696
1760.56	1.400	0.0001745	3.861	5.680
1765.54	1.400	0.0001786	3.961	5.664
1770.54	1.400	0.0001748	3.889	5.648
1775.57	1.400	0.0001715	3.827	5.632
1780.63	1.400	0.0001669	3.734	5.616
1785.71	1.400	0.0001623	3.642	5.600
1790.83	1.400	0.0001504	3.385	5.584
1795.98	1.400	0.0001354	3.055	5.568
1801.15	1.400	0.0001277	2.890	5.552
1806.36	1.400	0.0001259	2.858	5.536
1816.86	1.400	0.0001144	2.611	5.504
1827.49	1.400	0.0001150	2.640	5.472
1838.24	1.400	0.0001176	2.718	5.440
1843.66	1.401	0.0001241	2.875	5.424
1849.11	1.401	0.0001382	3.212	5.408
1854.60	1.401	0.0001369	3.189	5.392
1857.36	1.401	0.0001379	3.219	5.384
1860.12	1.401	0.0001384	3.236	5.376
1862.89	1.401	0.0001451	3.396	5.368
1865.67	1.401	0.0001523	3.570	5.360
1868.46	1.401	0.0001527	3.586	5.352
1871.26	1.401	0.0001530	3.598	5.344
1874.06	1.401	0.0001610	3.793	5.336
1876.88	1.401	0.0001572	3.707	5.328
1879.70	1.401	0.0001536	3.628	5.320
1882.53	1.401	0.0001541	3.645	5.312
1885.37	1.401	0.0001501	3.556	5.304
1888.22	1.401	0.0001479	3.509	5.296
1891.07	1.401	0.0001473	3.499	5.288

DECANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
1893.94	1.401	0.0001435	3.414	5.280
1896.81	1.401	0.0001463	3.488	5.272
1899.70	1.401	0.0001506	3.596	5.264
1902.59	1.401	0.0001513	3.617	5.256
1905.49	1.401	0.0001512	3.620	5.248
1908.40	1.401	0.0001538	3.687	5.240
1911.32	1.401	0.0001544	3.709	5.232
1914.24	1.401	0.0001470	3.537	5.224
1917.18	1.401	0.0001447	3.486	5.216
1920.12	1.401	0.0001390	3.354	5.208
1923.08	1.401	0.0001325	3.201	5.200
1926.04	1.401	0.0001281	3.100	5.192
1929.01	1.401	0.0001226	2.972	5.184
1931.99	1.401	0.0001177	2.856	5.176
1934.99	1.401	0.0001211	2.945	5.168
1937.98	1.401	0.0001200	2.923	5.160
1940.99	1.401	0.0001159	2.826	5.152
1950.08	1.401	0.0001166	2.857	5.128
1953.13	1.401	0.0001186	2.911	5.120
1959.25	1.401	0.0001182	2.910	5.104
1962.32	1.401	0.0001171	2.887	5.096
1965.41	1.401	0.0001204	2.974	5.088
1968.50	1.401	0.0001211	2.996	5.080
1974.72	1.401	0.0001221	3.031	5.064
1977.85	1.401	0.0001253	3.114	5.056
1980.98	1.401	0.0001261	3.140	5.048
1984.13	1.401	0.0001262	3.146	5.040
1987.28	1.401	0.0001312	3.276	5.032
1990.45	1.401	0.0001369	3.424	5.024
1993.62	1.401	0.0001440	3.608	5.016
1996.81	1.402	0.0001534	3.848	5.008
2000.00	1.402	0.0001671	4.201	5.000
2003.21	1.402	0.0001852	4.661	4.992
2006.42	1.402	0.0002059	5.193	4.984
2009.65	1.402	0.0002292	5.787	4.976
2012.88	1.402	0.0002554	6.459	4.968
2016.13	1.402	0.0002746	6.958	4.960
2019.39	1.402	0.0002900	7.360	4.952
2029.22	1.402	0.0002963	7.555	4.928
2032.52	1.402	0.0002817	7.196	4.920
2035.83	1.402	0.0002709	6.931	4.912
2039.15	1.402	0.0002573	6.594	4.904
2042.48	1.402	0.0002426	6.227	4.896
2045.83	1.402	0.0002268	5.831	4.888
2049.18	1.402	0.0002162	5.568	4.880
2052.55	1.402	0.0002035	5.249	4.872
2055.92	1.402	0.0001927	4.978	4.864
2059.31	1.402	0.0001871	4.842	4.856
2062.71	1.402	0.0001799	4.664	4.848
2066.12	1.402	0.0001733	4.500	4.840
2069.54	1.402	0.0001694	4.405	4.832
2072.97	1.402	0.0001673	4.357	4.824
2076.41	1.402	0.0001607	4.194	4.816
2083.33	1.402	0.0001558	4.079	4.800
2086.81	1.402	0.0001532	4.018	4.792
2093.80	1.402	0.0001540	4.051	4.776

DECANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
2097.32	1.402	0.0001581	4.167	4.768
2100.84	1.402	0.0001589	4.195	4.760
2104.38	1.402	0.0001604	4.242	4.752
2107.93	1.402	0.0001637	4.337	4.744
2111.49	1.402	0.0001653	4.386	4.736
2115.06	1.402	0.0001665	4.426	4.728
2118.64	1.402	0.0001695	4.513	4.720
2122.24	1.402	0.0001772	4.727	4.712
2125.85	1.402	0.0001857	4.962	4.704
2129.47	1.402	0.0001929	5.163	4.696
2133.11	1.402	0.0002093	5.611	4.688
2136.75	1.402	0.0002242	6.021	4.680
2140.41	1.402	0.0002350	6.321	4.672
2144.08	1.402	0.0002440	6.574	4.664
2147.77	1.402	0.0002514	6.786	4.656
2151.46	1.402	0.0002575	6.962	4.648
2155.17	1.402	0.0002569	6.957	4.640
2158.90	1.402	0.0002557	6.937	4.632
2162.63	1.402	0.0002579	7.008	4.624
2166.38	1.402	0.0002568	6.990	4.616
2170.14	1.402	0.0002515	6.857	4.608
2173.91	1.402	0.0002526	6.901	4.600
2177.70	1.402	0.0002523	6.906	4.592
2181.50	1.402	0.0002512	6.887	4.584
2185.32	1.402	0.0002495	6.853	4.576
2189.14	1.402	0.0002483	6.831	4.568
2192.98	1.402	0.0002488	6.857	4.560
2196.84	1.402	0.0002504	6.912	4.552
2200.70	1.403	0.0002477	6.850	4.544
2204.59	1.403	0.0002485	6.884	4.536
2208.48	1.403	0.0002516	6.983	4.528
2212.39	1.403	0.0002507	6.971	4.520
2216.31	1.403	0.0002522	7.023	4.512
2220.25	1.403	0.0002563	7.152	4.504
2224.20	1.403	0.0002583	7.220	4.496
2228.16	1.403	0.0002625	7.350	4.488
2232.14	1.403	0.0002650	7.434	4.480
2236.14	1.403	0.0002669	7.500	4.472
2240.14	1.403	0.0002698	7.595	4.464
2244.17	1.403	0.0002724	7.681	4.456
2248.20	1.403	0.0002752	7.776	4.448
2252.25	1.403	0.0002775	7.854	4.440
2256.32	1.403	0.0002812	7.973	4.432
2260.40	1.403	0.0002838	8.060	4.424
2264.49	1.403	0.0002843	8.091	4.416
2268.60	1.403	0.0002873	8.189	4.408
2272.73	1.403	0.0002892	8.260	4.400
2276.87	1.403	0.0002917	8.345	4.392
2281.02	1.403	0.0002963	8.493	4.384
2285.19	1.403	0.0003031	8.703	4.376
2289.38	1.403	0.0003151	9.065	4.368
2293.58	1.403	0.0003236	9.326	4.360
2297.79	1.403	0.0003303	9.538	4.352
2302.03	1.403	0.0003384	9.789	4.344
2306.27	1.403	0.0003471	10.059	4.336
2310.54	1.403	0.0003556	10.326	4.328

DECANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
2314.82	1.403	0.0003591	10.447	4.320
2319.11	1.403	0.0003653	10.647	4.312
2323.42	1.403	0.0003676	10.734	4.304
2327.75	1.403	0.0003606	10.549	4.296
2332.09	1.403	0.0003612	10.585	4.288
2340.82	1.403	0.0003554	10.453	4.272
2345.22	1.403	0.0003547	10.452	4.264
2349.62	1.403	0.0003510	10.363	4.256
2354.05	1.403	0.0003465	10.249	4.248
2358.49	1.403	0.0003463	10.264	4.240
2362.95	1.404	0.0003539	10.509	4.232
2367.42	1.404	0.0003455	10.279	4.224
2371.92	1.404	0.0003491	10.406	4.216
2376.43	1.404	0.0003466	10.351	4.208
2380.95	1.404	0.0003413	10.210	4.200
2385.50	1.404	0.0003415	10.237	4.192
2390.06	1.404	0.0003357	10.081	4.184
2394.64	1.404	0.0003328	10.015	4.176
2399.23	1.404	0.0003262	9.835	4.168
2403.85	1.404	0.0003196	9.654	4.160
2408.48	1.404	0.0003163	9.572	4.152
2413.13	1.404	0.0003106	9.419	4.144
2417.80	1.404	0.0003038	9.229	4.136
2422.48	1.404	0.0002977	9.064	4.128
2427.18	1.404	0.0002921	8.908	4.120
2431.91	1.404	0.0002851	8.711	4.112
2436.65	1.404	0.0002753	8.431	4.104
2441.41	1.404	0.0002654	8.143	4.096
2446.18	1.404	0.0002566	7.889	4.088
2450.98	1.404	0.0002475	7.623	4.080
2455.80	1.404	0.0002413	7.445	4.072
2460.63	1.405	0.0002357	7.289	4.064
2465.48	1.405	0.0002344	7.261	4.056
2470.36	1.405	0.0002383	7.398	4.048
2475.25	1.405	0.0002432	7.566	4.040
2480.16	1.405	0.0002509	7.821	4.032
2485.09	1.405	0.0002665	8.322	4.024
2490.04	1.405	0.0002817	8.814	4.016
2495.01	1.405	0.0003000	9.405	4.008
2500.00	1.405	0.0003221	10.121	4.000
2505.01	1.405	0.0003394	10.683	3.992
2510.04	1.405	0.0003640	11.482	3.984
2515.09	1.405	0.0003898	12.320	3.976
2520.16	1.405	0.0004128	13.072	3.968
2525.25	1.406	0.0004325	13.725	3.960
2530.36	1.406	0.0004540	14.437	3.952
2535.50	1.406	0.0004735	15.087	3.944
2540.65	1.406	0.0004921	15.712	3.936
2545.83	1.406	0.0005128	16.404	3.928
2551.02	1.406	0.0005450	17.470	3.920
2556.24	1.406	0.0005764	18.517	3.912
2561.48	1.406	0.0006200	19.958	3.904
2572.02	1.406	0.0006032	19.496	3.888
2577.32	1.407	0.0006688	21.661	3.880
2582.65	1.407	0.0007295	23.676	3.872
2587.99	1.407	0.0007923	25.767	3.864

DECANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
2593.36	1.407	0.0008403	27.384	3.856
2598.75	1.407	0.0008823	28.815	3.848
2604.17	1.407	0.0009204	30.120	3.840
2609.60	1.407	0.0009560	31.350	3.832
2615.06	1.407	0.0009951	32.701	3.824
2620.55	1.407	0.0010271	33.822	3.816
2626.05	1.408	0.0010625	35.064	3.808
2631.58	1.408	0.0011245	37.186	3.800
2637.13	1.408	0.0012019	39.830	3.792
2642.71	1.408	0.0012786	42.462	3.784
2648.31	1.408	0.0013357	44.452	3.776
2653.93	1.408	0.0013896	46.344	3.768
2659.57	1.408	0.0014511	48.498	3.760
2665.25	1.409	0.0014661	49.103	3.752
2670.94	1.409	0.0014405	48.350	3.744
2676.66	1.409	0.0014038	47.217	3.736
2682.40	1.409	0.0013734	46.295	3.728
2688.17	1.409	0.0013566	45.827	3.720
2693.97	1.410	0.0013584	45.987	3.712
2699.78	1.410	0.0013880	47.090	3.704
2705.63	1.410	0.0014333	48.733	3.696
2711.50	1.411	0.0015112	51.493	3.688
2717.39	1.411	0.0016052	54.815	3.680
2723.31	1.411	0.0016183	55.380	3.672
2729.26	1.412	0.0016298	55.898	3.664
2735.23	1.412	0.0016638	57.188	3.656
2741.23	1.413	0.0016609	57.213	3.648
2747.25	1.413	0.0016535	57.084	3.640
2753.30	1.414	0.0016816	58.183	3.632
2759.38	1.415	0.0017776	61.638	3.624
2765.49	1.415	0.0019698	68.453	3.616
2771.62	1.416	0.0022423	78.096	3.608
2777.78	1.417	0.0026190	91.420	3.600
2783.96	1.418	0.0032129	112.402	3.592
2790.18	1.420	0.0035614	124.871	3.584
2796.42	1.421	0.0041170	144.675	3.576
2802.69	1.422	0.0048081	169.341	3.568
2808.99	1.424	0.0055772	196.869	3.560
2815.32	1.427	0.0064872	229.506	3.552
2821.67	1.430	0.0095079	337.132	3.544
2828.05	1.433	0.0131563	467.554	3.536
2834.47	1.434	0.0193230	688.267	3.528
2840.91	1.434	0.0244318	872.214	3.520
2847.38	1.432	0.0295268	1056.507	3.512
2853.88	1.428	0.0340205	1220.076	3.504
2860.41	1.424	0.0361765	1300.364	3.496
2866.97	1.420	0.0364781	1314.213	3.488
2873.56	1.418	0.0360492	1301.746	3.480
2880.18	1.418	0.0364951	1320.881	3.472
2886.84	1.418	0.0383283	1390.438	3.464
2893.52	1.418	0.0420405	1528.636	3.456
2900.23	1.417	0.0471720	1719.202	3.448
2906.98	1.413	0.0540529	1974.563	3.440
2913.75	1.405	0.0605133	2215.709	3.432
2920.56	1.392	0.0636977	2337.760	3.424
2927.40	1.378	0.0595081	2189.113	3.416

DECANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
2934.27	1.368	0.0487597	1797.922	3.408
2941.18	1.364	0.0387573	1432.467	3.400
2948.11	1.362	0.0299108	1108.105	3.392
2955.08	1.363	0.0229081	850.685	3.384
2962.09	1.365	0.0173278	644.986	3.376
2969.12	1.366	0.0124417	464.214	3.368
2976.19	1.369	0.0077123	288.440	3.360
2983.29	1.373	0.0055145	206.734	3.352
2990.43	1.376	0.0045970	172.749	3.344
2997.60	1.378	0.0038331	144.389	3.336
3004.81	1.379	0.0031406	118.589	3.328
3012.05	1.381	0.0026359	99.772	3.320
3019.32	1.382	0.0022239	84.379	3.312
3026.63	1.383	0.0019065	72.510	3.304
3033.98	1.384	0.0016106	61.405	3.296
3041.36	1.385	0.0013661	52.211	3.288
3048.78	1.386	0.0011878	45.507	3.280
3056.24	1.387	0.0010460	40.173	3.272
3063.73	1.387	0.0009228	35.526	3.264
3071.25	1.388	0.0008139	31.413	3.256
3078.82	1.389	0.0007335	28.380	3.248
3086.42	1.389	0.0006801	26.377	3.240
3094.06	1.390	0.0006197	24.095	3.232
3101.74	1.390	0.0005911	23.039	3.224
3109.45	1.391	0.0005499	21.488	3.216
3117.21	1.391	0.0005361	20.999	3.208
3125.00	1.391	0.0005286	20.758	3.200
3132.83	1.392	0.0005209	20.506	3.192
3140.70	1.392	0.0005083	20.060	3.184
3148.62	1.392	0.0005160	20.415	3.176
3156.57	1.392	0.0005003	19.844	3.168
3164.56	1.393	0.0004883	19.418	3.160
3172.59	1.393	0.0004639	18.496	3.152
3180.66	1.393	0.0004364	17.441	3.144
3188.78	1.393	0.0003999	16.023	3.136
3196.93	1.393	0.0003565	14.322	3.128
3205.13	1.394	0.0003524	14.193	3.120
3213.37	1.394	0.0003156	12.744	3.112
3221.65	1.394	0.0002800	11.335	3.104
3229.97	1.394	0.0002519	10.225	3.096
3238.34	1.394	0.0002275	9.257	3.088
3246.75	1.394	0.0002093	8.541	3.080
3255.21	1.395	0.0001946	7.959	3.072
3263.71	1.395	0.0001825	7.485	3.064
3272.25	1.395	0.0001715	7.053	3.056
3280.84	1.395	0.0001664	6.860	3.048
3289.47	1.395	0.0001634	6.753	3.040
3298.15	1.395	0.0001587	6.577	3.032
3306.88	1.395	0.0001564	6.500	3.024
3315.65	1.396	0.0001544	6.434	3.016
3324.47	1.396	0.0001555	6.495	3.008
3333.33	1.396	0.0001552	6.500	3.000
3342.25	1.396	0.0001548	6.503	2.992
3351.21	1.396	0.0001526	6.425	2.984
3360.22	1.396	0.0001501	6.338	2.976
3369.27	1.396	0.0001486	6.292	2.968

DECANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
3378.38	1.396	0.0001445	6.133	2.960
3387.53	1.396	0.0001380	5.876	2.952
3396.74	1.396	0.0001305	5.568	2.944
3406.00	1.396	0.0001257	5.380	2.936
3415.30	1.396	0.0001202	5.157	2.928
3424.66	1.397	0.0001103	4.748	2.920
3434.07	1.397	0.0001011	4.362	2.912
3443.53	1.397	0.0000927	4.010	2.904
3453.04	1.397	0.0000826	3.586	2.896
3462.60	1.397	0.0000746	3.247	2.888
3472.22	1.397	0.0000680	2.966	2.880
3481.89	1.397	0.0000628	2.748	2.872
3491.62	1.397	0.0000598	2.622	2.864
3511.24	1.397	0.0000594	2.622	2.848
3521.13	1.397	0.0000620	2.741	2.840
3531.07	1.397	0.0000699	3.102	2.832
3541.08	1.397	0.0000784	3.488	2.824
3551.14	1.398	0.0000928	4.142	2.816
3561.25	1.398	0.0001093	4.889	2.808
3571.43	1.398	0.0001276	5.727	2.800
3581.66	1.398	0.0001473	6.631	2.792
3591.95	1.398	0.0001460	6.591	2.784
3602.31	1.398	0.0001685	7.626	2.776
3612.72	1.398	0.0001856	8.425	2.768
3623.19	1.398	0.0001957	8.911	2.760
3633.72	1.398	0.0002064	9.427	2.752
3644.32	1.398	0.0002029	9.291	2.744
3654.97	1.398	0.0002000	9.188	2.736
3665.69	1.398	0.0001969	9.071	2.728
3676.47	1.398	0.0001948	8.999	2.720
3687.32	1.398	0.0001900	8.804	2.712
3698.23	1.398	0.0001910	8.876	2.704
3709.20	1.398	0.0001922	8.959	2.696
3720.24	1.398	0.0001931	9.026	2.688
3731.34	1.398	0.0001972	9.247	2.680
3742.52	1.398	0.0002011	9.459	2.672
3753.75	1.398	0.0002022	9.536	2.664
3765.06	1.398	0.0002055	9.725	2.656
3776.44	1.398	0.0002081	9.874	2.648
3787.88	1.398	0.0002109	10.039	2.640
3799.39	1.398	0.0002112	10.085	2.632
3810.98	1.398	0.0002137	10.233	2.624
3822.63	1.399	0.0002182	10.480	2.616
3834.36	1.399	0.0002197	10.586	2.608
3846.15	1.399	0.0002180	10.538	2.600
3858.03	1.399	0.0002187	10.604	2.592
3869.97	1.399	0.0002203	10.711	2.584
3881.99	1.399	0.0002192	10.692	2.576
3894.08	1.399	0.0002233	10.928	2.568
3906.25	1.399	0.0002236	10.976	2.560
4000.00	1.399	0.0003850	19.350	2.500
4090.00	1.399	0.0005781	29.710	2.445
4337.00	1.399	0.0007182	39.140	2.306
4390.00	1.399	0.0003990	22.010	2.278
4473.00	1.399	0.0001244	6.990	2.236
4615.00	1.399	0.0000526	3.050	2.167

DECANE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
4737.00	1.400	0.0000242	1.440	2.111
4800.00	1.400	0.0000239	1.440	2.083
4900.00	1.400	0.0000234	1.440	2.041
5000.00	1.400	0.0000229	1.440	2.000

1-HEXENE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
400.00	1.386	0.0013261	6.666	25.000
416.67	1.386	0.0012731	6.666	24.000
434.78	1.387	0.0012790	6.988	23.000
443.46	1.388	0.0013730	7.651	22.550
451.16	1.388	0.0020443	11.590	22.165
454.55	1.388	0.0023708	13.542	22.000
461.68	1.388	0.0030743	17.836	21.660
465.22	1.387	0.0033113	19.358	21.495
468.82	1.387	0.0030274	17.836	21.330
474.95	1.384	0.0036889	22.017	21.055
476.19	1.385	0.0019753	11.820	21.000
487.92	1.387	0.0015782	9.676	20.495
500.00	1.388	0.0013010	8.175	20.000
504.41	1.388	0.0012618	7.998	19.825
511.51	1.389	0.0012443	7.998	19.550
517.33	1.390	0.0013129	8.535	19.330
520.29	1.390	0.0014499	9.479	19.220
526.32	1.391	0.0018952	12.535	19.000
537.49	1.392	0.0032597	22.017	18.605
545.55	1.393	0.0059180	40.572	18.330
550.51	1.392	0.0093705	64.824	18.165
553.02	1.390	0.0098679	68.576	18.083
555.56	1.387	0.0092853	64.824	18.000
561.01	1.386	0.0057549	40.572	17.825
566.25	1.387	0.0039371	28.015	17.660
577.03	1.389	0.0030406	22.048	17.330
588.24	1.392	0.0037899	28.015	17.000
598.27	1.394	0.0053965	40.572	16.715
606.24	1.396	0.0070897	54.011	16.495
614.44	1.398	0.0120288	92.877	16.275
625.00	1.394	0.0212120	166.598	16.000
628.63	1.390	0.0236877	187.124	15.908
634.12	1.382	0.0244146	194.550	15.770
635.22	1.381	0.0234420	187.124	15.743
652.32	1.373	0.0113302	92.877	15.330
666.67	1.376	0.0011318	9.482	15.000
677.97	1.381	0.0008202	6.988	14.750
689.66	1.384	0.0006626	5.742	14.500
693.64	1.385	0.0006250	5.448	14.417
701.75	1.387	0.0006851	6.041	14.250
714.29	1.391	0.0020860	18.724	14.000
715.10	1.392	0.0026450	23.769	13.984
716.74	1.392	0.0029232	26.329	13.952
718.39	1.392	0.0036829	33.248	13.920
719.22	1.393	0.0040079	36.224	13.904
720.05	1.393	0.0046070	41.686	13.888
720.88	1.393	0.0055847	50.591	13.872
721.71	1.393	0.0057027	51.719	13.856
723.38	1.394	0.0069903	63.544	13.824
724.22	1.394	0.0085736	78.026	13.808
725.06	1.394	0.0097901	89.202	13.792
725.90	1.393	0.0098099	89.485	13.776
726.74	1.393	0.0112834	103.045	13.760

1-HEXENE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
727.59	1.392	0.0118597	108.436	13.744
729.29	1.391	0.0125184	114.726	13.712
730.14	1.390	0.0135475	124.301	13.696
730.99	1.389	0.0135837	124.778	13.680
731.85	1.388	0.0142805	131.333	13.664
733.57	1.386	0.0141914	130.820	13.632
735.29	1.385	0.0131251	121.275	13.600
737.03	1.384	0.0125809	116.522	13.568
737.90	1.383	0.0124763	115.690	13.552
740.52	1.382	0.0116157	108.092	13.504
742.28	1.381	0.0101817	94.973	13.472
743.16	1.381	0.0100087	93.470	13.456
744.93	1.379	0.0090829	85.025	13.424
745.82	1.379	0.0076112	71.334	13.408
746.71	1.379	0.0072206	67.754	13.392
747.61	1.379	0.0063642	59.790	13.376
748.50	1.380	0.0061023	57.398	13.360
749.40	1.379	0.0054978	51.774	13.344
750.30	1.380	0.0043366	40.888	13.328
752.11	1.381	0.0033758	31.905	13.296
758.50	1.383	0.0029619	28.232	13.184
759.42	1.383	0.0029085	27.756	13.168
764.99	1.384	0.0027624	26.555	13.072
766.87	1.384	0.0024862	23.959	13.040
767.81	1.384	0.0021305	20.557	13.024
768.76	1.385	0.0019469	18.808	13.008
777.36	1.388	0.0018342	17.918	12.864
778.33	1.388	0.0022434	21.942	12.848
779.30	1.389	0.0025017	24.499	12.832
780.27	1.389	0.0029364	28.792	12.816
781.25	1.389	0.0034131	33.508	12.800
782.23	1.389	0.0038563	37.907	12.784
783.21	1.389	0.0038396	37.790	12.768
784.19	1.389	0.0045534	44.871	12.752
785.18	1.388	0.0048566	47.919	12.736
787.15	1.388	0.0049648	49.110	12.704
788.15	1.387	0.0051270	50.779	12.688
789.14	1.387	0.0048009	47.609	12.672
790.14	1.387	0.0045924	45.599	12.656
791.14	1.387	0.0046839	46.566	12.640
792.14	1.386	0.0042854	42.658	12.624
793.15	1.386	0.0036279	36.159	12.608
794.16	1.386	0.0033753	33.684	12.592
795.17	1.386	0.0030850	30.827	12.576
796.18	1.386	0.0023399	23.411	12.560
797.19	1.387	0.0019476	19.510	12.544
798.21	1.387	0.0018001	18.056	12.528
805.41	1.390	0.0017530	17.742	12.416
806.45	1.391	0.0021927	22.221	12.400
807.49	1.391	0.0028310	28.727	12.384
808.54	1.391	0.0031019	31.516	12.368
809.59	1.391	0.0034996	35.604	12.352
810.64	1.391	0.0040835	41.598	12.336
811.69	1.391	0.0042713	43.568	12.320
812.74	1.391	0.0042590	43.498	12.304
813.80	1.390	0.0047109	48.176	12.288

1-HEXENE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
814.86	1.390	0.0046855	47.978	12.272
815.93	1.390	0.0043385	44.484	12.256
816.99	1.390	0.0043083	44.232	12.240
818.06	1.389	0.0041450	42.610	12.224
819.14	1.389	0.0036592	37.667	12.208
820.21	1.389	0.0032693	33.697	12.192
821.29	1.390	0.0027102	27.971	12.176
822.37	1.390	0.0026984	27.886	12.160
823.45	1.390	0.0020194	20.896	12.144
825.63	1.391	0.0019701	20.440	12.112
826.72	1.391	0.0019264	20.013	12.096
827.81	1.392	0.0019083	19.851	12.080
828.91	1.392	0.0022144	23.066	12.064
830.01	1.393	0.0023238	24.238	12.048
831.12	1.393	0.0024744	25.843	12.032
832.22	1.393	0.0027015	28.252	12.016
833.33	1.393	0.0027949	29.268	12.000
834.45	1.393	0.0030569	32.054	11.984
835.56	1.393	0.0031472	33.046	11.968
836.68	1.394	0.0030930	32.520	11.952
837.80	1.394	0.0032296	34.001	11.936
838.93	1.394	0.0032228	33.976	11.920
840.05	1.394	0.0032356	34.156	11.904
841.18	1.394	0.0031368	33.158	11.888
843.45	1.394	0.0028457	30.161	11.856
844.59	1.394	0.0026266	27.877	11.840
845.74	1.395	0.0021840	23.211	11.824
846.88	1.395	0.0021783	23.182	11.808
848.03	1.396	0.0019979	21.291	11.792
850.34	1.397	0.0019032	20.337	11.760
851.50	1.398	0.0017577	18.808	11.744
852.66	1.398	0.0017771	19.041	11.728
853.83	1.399	0.0019876	21.326	11.712
854.99	1.400	0.0020373	21.889	11.696
856.16	1.400	0.0024709	26.584	11.680
857.34	1.401	0.0028067	30.239	11.664
858.52	1.402	0.0030499	32.904	11.648
859.70	1.402	0.0036359	39.279	11.632
860.88	1.403	0.0038815	41.991	11.616
862.07	1.403	0.0042357	45.886	11.600
863.26	1.404	0.0045103	48.928	11.584
864.45	1.404	0.0047493	51.592	11.568
865.65	1.405	0.0049696	54.060	11.552
866.85	1.405	0.0053542	58.324	11.536
868.06	1.406	0.0053294	58.135	11.520
869.26	1.407	0.0055930	61.094	11.504
870.47	1.408	0.0068761	75.215	11.488
871.69	1.409	0.0078620	86.120	11.472
872.91	1.409	0.0085841	94.162	11.456
874.13	1.409	0.0086230	94.721	11.440
875.35	1.410	0.0092220	101.442	11.424
876.58	1.411	0.0099965	110.115	11.408
877.81	1.411	0.0098841	109.030	11.392
879.04	1.412	0.0105786	116.855	11.376
880.28	1.413	0.0111466	123.303	11.360
881.52	1.415	0.0118325	131.075	11.344

1-HEXENE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
882.77	1.416	0.0122811	136.237	11.328
884.02	1.418	0.0132053	146.696	11.312
885.27	1.419	0.0150905	167.876	11.296
886.52	1.421	0.0155550	173.288	11.280
887.78	1.423	0.0171764	191.623	11.264
889.05	1.426	0.0200547	224.054	11.248
890.31	1.427	0.0235182	263.121	11.232
891.58	1.428	0.0263839	295.603	11.216
892.86	1.429	0.0293127	328.889	11.200
894.13	1.430	0.0323532	363.519	11.184
895.42	1.432	0.0352049	396.132	11.168
896.70	1.435	0.0406439	457.986	11.152
899.28	1.435	0.0538226	608.233	11.120
900.58	1.437	0.0587810	665.226	11.104
901.88	1.436	0.0720336	816.382	11.088
903.18	1.432	0.0806800	915.693	11.072
907.11	1.388	0.1187587	1353.740	11.024
911.08	1.344	0.0785470	899.283	10.976
913.74	1.342	0.0584526	671.176	10.944
915.08	1.341	0.0546242	628.136	10.928
916.42	1.341	0.0443943	511.248	10.912
917.77	1.343	0.0418904	483.124	10.896
919.12	1.344	0.0357133	412.489	10.880
920.47	1.346	0.0324005	374.775	10.864
921.83	1.347	0.0299066	346.439	10.848
923.19	1.348	0.0261048	302.846	10.832
924.56	1.350	0.0241732	280.854	10.816
925.93	1.351	0.0212775	247.576	10.800
927.30	1.353	0.0193846	225.885	10.784
928.68	1.354	0.0179856	209.894	10.768
930.06	1.355	0.0158414	185.146	10.752
931.45	1.357	0.0143639	168.129	10.736
932.84	1.358	0.0133625	156.640	10.720
934.23	1.359	0.0116163	136.374	10.704
935.63	1.361	0.0103507	121.698	10.688
937.03	1.362	0.0089566	105.464	10.672
938.44	1.364	0.0082949	97.820	10.656
939.85	1.365	0.0073727	87.076	10.640
941.27	1.367	0.0065534	77.515	10.624
942.68	1.369	0.0061829	73.243	10.608
944.11	1.370	0.0056968	67.587	10.592
945.54	1.372	0.0053022	63.000	10.576
946.97	1.373	0.0052982	63.048	10.560
948.41	1.375	0.0052229	62.247	10.544
951.29	1.377	0.0050631	60.526	10.512
952.74	1.379	0.0049438	59.190	10.496
954.20	1.380	0.0052143	62.524	10.480
955.66	1.382	0.0053719	64.512	10.464
957.12	1.383	0.0054862	65.986	10.448
958.59	1.385	0.0058048	69.925	10.432
960.06	1.387	0.0062641	75.573	10.416
961.54	1.388	0.0069432	83.895	10.400
963.02	1.390	0.0074233	89.834	10.384
964.51	1.393	0.0079646	96.534	10.368
966.00	1.395	0.0110443	134.069	10.352
967.49	1.396	0.0111668	135.764	10.336

1-HEXENE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
968.99	1.402	0.0129970	158.261	10.320
970.50	1.402	0.0222636	271.519	10.304
973.52	1.398	0.0259147	317.030	10.272
975.04	1.398	0.0269322	329.992	10.256
976.56	1.398	0.0293028	359.598	10.240
978.09	1.398	0.0298953	367.444	10.224
979.62	1.399	0.0334414	411.672	10.208
981.16	1.400	0.0339673	418.805	10.192
982.70	1.402	0.0405948	501.305	10.176
984.25	1.401	0.0455594	563.499	10.160
985.80	1.401	0.0529951	656.499	10.144
987.36	1.395	0.0630772	782.632	10.128
988.92	1.387	0.0664471	825.747	10.112
990.49	1.374	0.0751969	935.965	10.096
992.06	1.361	0.0671113	836.650	10.080
993.64	1.354	0.0625968	781.612	10.064
995.22	1.348	0.0552609	691.110	10.048
996.81	1.346	0.0486480	609.379	10.032
998.40	1.344	0.0450809	565.597	10.016
1000.00	1.344	0.0383556	481.991	10.000
1001.60	1.345	0.0373840	470.533	9.984
1003.21	1.343	0.0346766	437.158	9.968
1004.82	1.343	0.0320099	404.187	9.952
1008.07	1.332	0.0304114	385.245	9.920
1009.69	1.332	0.0122054	154.864	9.904
1012.97	1.345	0.0086485	110.090	9.872
1014.61	1.349	0.0083652	106.656	9.856
1016.26	1.351	0.0082454	105.299	9.840
1017.92	1.353	0.0087389	111.784	9.824
1021.24	1.355	0.0087216	111.927	9.792
1022.91	1.355	0.0082439	105.970	9.776
1026.27	1.356	0.0078914	101.771	9.744
1027.96	1.357	0.0069364	89.602	9.728
1029.65	1.357	0.0070020	90.598	9.712
1031.35	1.358	0.0064807	83.992	9.696
1033.06	1.358	0.0059955	77.832	9.680
1034.77	1.358	0.0055206	71.787	9.664
1036.48	1.359	0.0043253	56.337	9.648
1038.21	1.360	0.0038932	50.793	9.632
1045.15	1.362	0.0039362	51.697	9.568
1046.90	1.362	0.0038235	50.300	9.552
1048.66	1.363	0.0030253	39.867	9.536
1050.42	1.363	0.0026409	34.860	9.520
1052.19	1.364	0.0023298	30.805	9.504
1053.96	1.365	0.0022251	29.470	9.488
1055.74	1.365	0.0023447	31.106	9.472
1057.53	1.366	0.0021378	28.410	9.456
1059.32	1.367	0.0025176	33.514	9.440
1061.12	1.367	0.0026880	35.843	9.424
1062.93	1.367	0.0031216	41.696	9.408
1064.74	1.367	0.0035422	47.394	9.392
1066.55	1.367	0.0034047	45.633	9.376
1068.38	1.367	0.0035725	47.964	9.360
1070.21	1.367	0.0030704	41.293	9.344
1072.04	1.367	0.0027150	36.575	9.328
1073.88	1.368	0.0022986	31.019	9.312

1-HEXENE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
1075.73	1.368	0.0018111	24.482	9.296
1077.59	1.369	0.0018316	24.802	9.280
1079.45	1.369	0.0017956	24.357	9.264
1081.32	1.370	0.0018149	24.662	9.248
1083.19	1.370	0.0021121	28.750	9.232
1085.07	1.371	0.0022919	31.251	9.216
1086.96	1.372	0.0028777	39.307	9.200
1088.85	1.372	0.0035839	49.039	9.184
1090.75	1.372	0.0039281	53.842	9.168
1092.66	1.372	0.0046930	64.438	9.152
1094.57	1.371	0.0049145	67.597	9.136
1096.49	1.371	0.0051599	71.098	9.120
1098.42	1.370	0.0054997	75.913	9.104
1100.35	1.370	0.0050161	69.360	9.088
1102.29	1.369	0.0049046	67.937	9.072
1104.24	1.369	0.0039301	54.535	9.056
1106.20	1.369	0.0031634	43.974	9.040
1108.16	1.369	0.0026431	36.806	9.024
1110.12	1.370	0.0022689	31.651	9.008
1112.10	1.370	0.0023645	33.043	8.992
1114.08	1.371	0.0025664	35.929	8.976
1116.07	1.371	0.0026643	37.366	8.960
1118.07	1.371	0.0025220	35.434	8.944
1120.07	1.371	0.0024546	34.549	8.928
1122.08	1.371	0.0022000	31.021	8.912
1124.10	1.371	0.0017952	25.358	8.896
1126.13	1.371	0.0016475	23.314	8.880
1130.20	1.372	0.0016310	23.165	8.848
1132.25	1.373	0.0021645	30.797	8.832
1134.30	1.373	0.0026034	37.108	8.816
1136.36	1.373	0.0027984	39.961	8.800
1142.60	1.372	0.0029726	42.682	8.752
1144.69	1.372	0.0027493	39.547	8.736
1146.79	1.371	0.0022755	32.792	8.720
1148.90	1.372	0.0016686	24.091	8.704
1151.01	1.372	0.0013508	19.539	8.688
1153.14	1.372	0.0011328	16.415	8.672
1159.56	1.373	0.0011279	16.435	8.624
1161.71	1.374	0.0012975	18.941	8.608
1163.87	1.374	0.0015957	23.338	8.592
1166.05	1.374	0.0018513	27.127	8.576
1168.22	1.374	0.0017906	26.287	8.560
1170.41	1.373	0.0016232	23.874	8.544
1172.61	1.373	0.0013791	20.322	8.528
1174.81	1.374	0.0008818	13.018	8.512
1188.21	1.375	0.0009893	14.772	8.416
1190.48	1.376	0.0013645	20.413	8.400
1192.75	1.376	0.0015491	23.218	8.384
1195.03	1.375	0.0015880	23.847	8.368
1197.32	1.375	0.0014637	22.022	8.352
1199.62	1.375	0.0011858	17.876	8.336
1201.92	1.376	0.0010185	15.384	8.320
1204.24	1.376	0.0010610	16.056	8.304
1206.56	1.376	0.0011290	17.118	8.288
1208.90	1.377	0.0014040	21.328	8.272
1211.24	1.377	0.0018167	27.652	8.256

1-HEXENE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
1213.59	1.377	0.0020040	30.561	8.240
1215.95	1.376	0.0021395	32.691	8.224
1218.32	1.376	0.0021993	33.671	8.208
1220.70	1.376	0.0021904	33.601	8.192
1223.09	1.376	0.0019250	29.586	8.176
1225.49	1.376	0.0016262	25.043	8.160
1227.90	1.376	0.0013438	20.735	8.144
1230.32	1.377	0.0010953	16.934	8.128
1232.74	1.377	0.0011481	17.786	8.112
1235.18	1.378	0.0015266	23.696	8.096
1237.62	1.378	0.0021432	33.332	8.080
1240.08	1.378	0.0028662	44.665	8.064
1242.55	1.377	0.0032758	51.150	8.048
1245.02	1.376	0.0030888	48.326	8.032
1247.51	1.376	0.0024650	38.643	8.016
1250.00	1.376	0.0017998	28.272	8.000
1252.51	1.377	0.0011451	18.023	7.984
1262.63	1.378	0.0012583	19.965	7.920
1265.18	1.379	0.0017477	27.787	7.904
1267.75	1.379	0.0019757	31.475	7.888
1270.33	1.378	0.0019819	31.638	7.872
1272.91	1.379	0.0019412	31.052	7.856
1275.51	1.379	0.0019193	30.764	7.840
1278.12	1.379	0.0019388	31.139	7.824
1280.74	1.379	0.0022461	36.149	7.808
1283.37	1.380	0.0026011	41.948	7.792
1286.01	1.380	0.0029267	47.296	7.776
1288.66	1.379	0.0035729	57.859	7.760
1299.38	1.378	0.0035502	57.969	7.696
1302.08	1.378	0.0029201	47.780	7.680
1304.80	1.378	0.0022414	36.751	7.664
1307.53	1.379	0.0020190	33.174	7.648
1310.27	1.379	0.0021400	35.235	7.632
1313.03	1.380	0.0024576	40.550	7.616
1315.79	1.380	0.0029295	48.438	7.600
1318.57	1.380	0.0031247	51.774	7.584
1321.35	1.380	0.0029315	48.677	7.568
1324.15	1.380	0.0027497	45.754	7.552
1326.96	1.380	0.0025559	42.619	7.536
1329.79	1.380	0.0024631	41.160	7.520
1332.62	1.381	0.0025910	43.390	7.504
1335.47	1.381	0.0031636	53.091	7.488
1338.33	1.381	0.0037167	62.507	7.472
1341.20	1.381	0.0038025	64.087	7.456
1344.09	1.381	0.0036512	61.670	7.440
1346.98	1.381	0.0035119	59.445	7.424
1349.89	1.382	0.0032479	55.095	7.408
1352.81	1.382	0.0035968	61.145	7.392
1355.75	1.383	0.0036459	62.114	7.376
1358.70	1.383	0.0040262	68.743	7.360
1361.66	1.384	0.0047140	80.662	7.344
1364.63	1.385	0.0053897	92.424	7.328
1367.62	1.385	0.0073740	126.730	7.312
1370.61	1.384	0.0097646	168.182	7.296
1373.63	1.381	0.0103315	178.338	7.280
1376.65	1.379	0.0090911	157.271	7.264

1-HEXENE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
1379.69	1.378	0.0073963	128.235	7.248
1382.74	1.379	0.0053203	92.446	7.232
1385.81	1.380	0.0044143	76.873	7.216
1388.89	1.381	0.0040701	71.037	7.200
1391.98	1.382	0.0035154	61.492	7.184
1395.09	1.383	0.0032876	57.636	7.168
1398.21	1.384	0.0037041	65.082	7.152
1401.35	1.386	0.0042736	75.257	7.136
1404.49	1.387	0.0062347	110.038	7.120
1407.66	1.388	0.0075130	132.899	7.104
1410.84	1.388	0.0088165	156.309	7.088
1414.03	1.387	0.0095347	169.425	7.072
1417.23	1.388	0.0093035	165.690	7.056
1420.46	1.389	0.0102037	182.137	7.040
1423.69	1.392	0.0116073	207.662	7.024
1426.94	1.393	0.0172324	309.002	7.008
1430.21	1.391	0.0203295	365.373	6.992
1433.49	1.389	0.0232985	419.693	6.976
1436.78	1.386	0.0246507	445.071	6.960
1440.09	1.384	0.0247703	448.261	6.944
1443.42	1.384	0.0262925	476.908	6.928
1446.76	1.383	0.0303188	551.212	6.912
1450.12	1.378	0.0341626	622.537	6.896
1453.49	1.372	0.0348340	636.246	6.880
1456.88	1.366	0.0337861	618.546	6.864
1460.28	1.360	0.0314757	577.592	6.848
1463.70	1.354	0.0272672	501.537	6.832
1467.14	1.351	0.0197171	363.516	6.816
1470.59	1.351	0.0121199	223.976	6.800
1474.06	1.355	0.0074225	137.492	6.784
1477.54	1.358	0.0059129	109.786	6.768
1481.04	1.360	0.0048130	89.576	6.752
1484.56	1.361	0.0036990	69.007	6.736
1488.10	1.363	0.0026140	48.882	6.720
1491.65	1.364	0.0024515	45.952	6.704
1495.22	1.365	0.0024382	45.812	6.688
1498.80	1.366	0.0022972	43.266	6.672
1502.40	1.367	0.0017621	33.267	6.656
1524.39	1.370	0.0015924	30.503	6.560
1528.12	1.370	0.0015434	29.638	6.544
1535.63	1.371	0.0013339	25.741	6.512
1539.41	1.371	0.0013401	25.924	6.496
1543.21	1.371	0.0015104	29.291	6.480
1547.03	1.371	0.0015328	29.798	6.464
1550.87	1.372	0.0011834	23.063	6.448
1594.39	1.375	0.0010760	21.559	6.272
1598.47	1.376	0.0013712	27.543	6.256
1602.56	1.376	0.0014927	30.061	6.240
1606.68	1.377	0.0016254	32.817	6.224
1610.83	1.378	0.0023429	47.425	6.208
1614.99	1.378	0.0026436	53.651	6.192
1619.17	1.380	0.0036405	74.073	6.176
1623.38	1.381	0.0055164	112.534	6.160
1627.60	1.381	0.0098176	200.800	6.144
1631.85	1.378	0.0142047	291.289	6.128
1636.13	1.372	0.0154037	316.702	6.112

1-HEXENE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
1640.42	1.367	0.0116111	239.353	6.096
1644.74	1.365	0.0068918	142.443	6.080
1649.08	1.366	0.0034949	72.425	6.064
1653.44	1.368	0.0021616	44.912	6.048
1657.83	1.369	0.0016114	33.571	6.032
1662.23	1.370	0.0011231	23.459	6.016
1666.67	1.371	0.0010380	21.740	6.000
1671.12	1.371	0.0009693	20.355	5.984
1675.60	1.371	0.0008752	18.429	5.968
1680.11	1.372	0.0007714	16.287	5.952
1684.64	1.372	0.0006758	14.307	5.936
1689.19	1.372	0.0006364	13.508	5.920
1693.77	1.372	0.0005611	11.943	5.904
1698.37	1.373	0.0005365	11.449	5.888
1703.00	1.373	0.0004837	10.351	5.872
1707.65	1.373	0.0004644	9.965	5.856
1712.33	1.373	0.0004339	9.336	5.840
1717.03	1.373	0.0004003	8.637	5.824
1721.76	1.374	0.0003949	8.544	5.808
1726.52	1.374	0.0003611	7.835	5.792
1731.30	1.374	0.0003621	7.877	5.776
1736.11	1.374	0.0003429	7.480	5.760
1740.95	1.374	0.0003424	7.491	5.744
1745.81	1.374	0.0003338	7.322	5.728
1750.70	1.374	0.0003306	7.274	5.712
1755.62	1.375	0.0003387	7.472	5.696
1760.56	1.375	0.0003364	7.443	5.680
1765.54	1.375	0.0003419	7.585	5.664
1770.54	1.375	0.0003873	8.617	5.648
1775.57	1.375	0.0004052	9.041	5.632
1780.63	1.375	0.0004645	10.395	5.616
1785.71	1.376	0.0005838	13.100	5.600
1790.83	1.376	0.0006450	14.515	5.584
1795.98	1.376	0.0011777	26.579	5.568
1801.15	1.376	0.0017466	39.531	5.552
1806.36	1.376	0.0023508	53.361	5.536
1811.59	1.375	0.0027194	61.907	5.520
1816.86	1.375	0.0026575	60.675	5.504
1822.16	1.374	0.0021673	49.627	5.488
1827.49	1.374	0.0015150	34.792	5.472
1832.85	1.374	0.0009297	21.413	5.456
1838.24	1.374	0.0006780	15.662	5.440
1843.66	1.374	0.0005407	12.526	5.424
1849.11	1.375	0.0004280	9.945	5.408
1851.85	1.375	0.0004654	10.830	5.400
1854.60	1.375	0.0004263	9.934	5.392
1857.36	1.375	0.0003843	8.969	5.384
1860.12	1.375	0.0003638	8.503	5.376
1862.89	1.375	0.0003330	7.795	5.368
1865.67	1.375	0.0003237	7.589	5.360
1868.46	1.375	0.0003140	7.372	5.352
1871.26	1.375	0.0002998	7.049	5.344
1874.06	1.375	0.0003023	7.119	5.336
1876.88	1.375	0.0003002	7.081	5.328
1879.70	1.375	0.0003039	7.180	5.320
1882.53	1.375	0.0003152	7.457	5.312

1-HEXENE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
1885.37	1.375	0.0003235	7.665	5.304
1888.22	1.375	0.0003343	7.933	5.296
1891.07	1.375	0.0003458	8.217	5.288
1893.94	1.375	0.0003400	8.093	5.280
1896.81	1.375	0.0003378	8.053	5.272
1899.70	1.375	0.0003238	7.729	5.264
1902.59	1.375	0.0002995	7.162	5.256
1905.49	1.375	0.0002867	6.865	5.248
1908.40	1.375	0.0002626	6.297	5.240
1911.32	1.376	0.0002474	5.941	5.232
1914.24	1.376	0.0002357	5.671	5.224
1917.18	1.376	0.0002190	5.277	5.216
1920.12	1.376	0.0002143	5.171	5.208
1923.08	1.376	0.0002068	4.999	5.200
1926.04	1.376	0.0001995	4.830	5.192
1929.01	1.376	0.0002049	4.968	5.184
1931.99	1.376	0.0002033	4.936	5.176
1934.99	1.376	0.0002105	5.119	5.168
1937.98	1.376	0.0002197	5.349	5.160
1940.99	1.376	0.0002276	5.552	5.152
1944.01	1.376	0.0002372	5.796	5.144
1947.04	1.376	0.0002501	6.119	5.136
1950.08	1.376	0.0002642	6.474	5.128
1953.13	1.376	0.0002845	6.982	5.120
1956.18	1.376	0.0003137	7.710	5.112
1959.25	1.376	0.0003551	8.743	5.104
1962.32	1.376	0.0004033	9.945	5.096
1965.41	1.376	0.0004513	11.146	5.088
1968.50	1.376	0.0004933	12.203	5.080
1971.61	1.376	0.0005137	12.728	5.072
1974.72	1.376	0.0005103	12.664	5.064
1977.85	1.376	0.0004841	12.033	5.056
1980.98	1.376	0.0004432	11.032	5.048
1984.13	1.376	0.0003876	9.664	5.040
1987.28	1.376	0.0003421	8.542	5.032
1990.45	1.376	0.0002967	7.420	5.024
1993.62	1.376	0.0002665	6.676	5.016
1996.81	1.376	0.0002444	6.132	5.008
2000.00	1.376	0.0002296	5.771	5.000
2003.21	1.376	0.0002244	5.649	4.992
2006.42	1.376	0.0002214	5.583	4.984
2009.65	1.376	0.0002259	5.706	4.976
2012.88	1.376	0.0002346	5.933	4.968
2016.13	1.376	0.0002436	6.173	4.960
2019.39	1.376	0.0002549	6.470	4.952
2022.65	1.376	0.0002662	6.766	4.944
2025.93	1.376	0.0002728	6.946	4.936
2029.22	1.376	0.0002702	6.889	4.928
2032.52	1.376	0.0002669	6.817	4.920
2035.83	1.376	0.0002579	6.597	4.912
2039.15	1.377	0.0002432	6.232	4.904
2042.48	1.377	0.0002332	5.985	4.896
2045.83	1.377	0.0002246	5.775	4.888
2049.18	1.377	0.0002204	5.676	4.880
2052.55	1.377	0.0002214	5.710	4.872
2055.92	1.377	0.0002250	5.813	4.864

1-HEXENE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
2059.31	1.377	0.0002279	5.897	4.856
2062.71	1.377	0.0002367	6.137	4.848
2066.12	1.377	0.0002371	6.155	4.840
2069.54	1.377	0.0002356	6.126	4.832
2072.97	1.377	0.0002342	6.100	4.824
2076.41	1.377	0.0002247	5.863	4.816
2079.87	1.377	0.0002168	5.667	4.808
2083.33	1.377	0.0002075	5.433	4.800
2086.81	1.377	0.0001946	5.104	4.792
2090.30	1.377	0.0001871	4.915	4.784
2093.80	1.377	0.0001816	4.779	4.776
2097.32	1.377	0.0001709	4.505	4.768
2100.84	1.377	0.0001674	4.419	4.760
2104.38	1.377	0.0001632	4.315	4.752
2107.93	1.377	0.0001571	4.162	4.744
2111.49	1.377	0.0001577	4.183	4.736
2115.06	1.377	0.0001554	4.131	4.728
2118.64	1.377	0.0001537	4.093	4.720
2122.24	1.377	0.0001584	4.225	4.712
2125.85	1.377	0.0001578	4.215	4.704
2129.47	1.377	0.0001598	4.275	4.696
2133.11	1.377	0.0001654	4.433	4.688
2136.75	1.377	0.0001676	4.501	4.680
2140.41	1.377	0.0001746	4.696	4.672
2144.08	1.377	0.0001803	4.859	4.664
2147.77	1.377	0.0001892	5.105	4.656
2151.46	1.377	0.0001962	5.305	4.648
2155.17	1.377	0.0001999	5.413	4.640
2158.90	1.377	0.0002052	5.567	4.632
2162.63	1.377	0.0002101	5.708	4.624
2166.38	1.377	0.0002122	5.776	4.616
2170.14	1.377	0.0002146	5.854	4.608
2173.91	1.377	0.0002166	5.917	4.600
2177.70	1.377	0.0002213	6.056	4.592
2181.50	1.377	0.0002231	6.116	4.584
2185.32	1.378	0.0002304	6.328	4.576
2189.14	1.378	0.0002392	6.582	4.568
2192.98	1.378	0.0002482	6.839	4.560
2196.84	1.378	0.0002598	7.171	4.552
2200.70	1.378	0.0002683	7.421	4.544
2204.59	1.378	0.0002786	7.718	4.536
2208.48	1.378	0.0002799	7.769	4.528
2212.39	1.378	0.0002818	7.835	4.520
2216.31	1.378	0.0002807	7.817	4.512
2220.25	1.378	0.0002732	7.621	4.504
2224.20	1.378	0.0002678	7.484	4.496
2228.16	1.378	0.0002663	7.457	4.488
2232.14	1.378	0.0002618	7.344	4.480
2236.14	1.378	0.0002630	7.391	4.472
2240.14	1.378	0.0002677	7.535	4.464
2244.17	1.378	0.0002665	7.515	4.456
2248.20	1.378	0.0002691	7.603	4.448
2252.25	1.378	0.0002662	7.535	4.440
2256.32	1.378	0.0002642	7.491	4.432
2260.40	1.378	0.0002650	7.528	4.424
2264.49	1.378	0.0002584	7.354	4.416

1-HEXENE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
2268.60	1.378	0.0002541	7.243	4.408
2272.73	1.378	0.0002511	7.170	4.400
2276.87	1.378	0.0002437	6.971	4.392
2281.02	1.378	0.0002387	6.841	4.384
2285.19	1.378	0.0002327	6.684	4.376
2289.38	1.378	0.0002330	6.704	4.368
2293.58	1.378	0.0002344	6.756	4.360
2297.79	1.378	0.0002326	6.716	4.352
2302.03	1.378	0.0002299	6.652	4.344
2306.27	1.378	0.0002404	6.966	4.336
2310.54	1.378	0.0002390	6.939	4.328
2314.82	1.378	0.0002445	7.112	4.320
2319.11	1.378	0.0002487	7.248	4.312
2323.42	1.378	0.0002448	7.148	4.304
2327.75	1.378	0.0002425	7.095	4.296
2332.09	1.378	0.0002384	6.987	4.288
2336.45	1.378	0.0002292	6.729	4.280
2340.82	1.378	0.0002222	6.536	4.272
2345.22	1.378	0.0002225	6.559	4.264
2349.62	1.378	0.0002320	6.849	4.256
2354.05	1.379	0.0002381	7.043	4.248
2358.49	1.379	0.0002598	7.699	4.240
2362.95	1.379	0.0002643	7.847	4.232
2367.42	1.379	0.0002778	8.264	4.224
2371.92	1.379	0.0002697	8.039	4.216
2376.43	1.379	0.0002702	8.070	4.208
2380.95	1.379	0.0002660	7.959	4.200
2385.50	1.379	0.0002547	7.634	4.192
2390.06	1.379	0.0002450	7.359	4.184
2394.64	1.379	0.0002379	7.160	4.176
2399.23	1.379	0.0002345	7.070	4.168
2403.85	1.379	0.0002324	7.021	4.160
2408.48	1.379	0.0002304	6.974	4.152
2413.13	1.379	0.0002336	7.082	4.144
2417.80	1.379	0.0002324	7.061	4.136
2422.48	1.379	0.0002370	7.214	4.128
2427.18	1.379	0.0002360	7.199	4.120
2431.91	1.379	0.0002335	7.136	4.112
2436.65	1.379	0.0002316	7.090	4.104
2441.41	1.379	0.0002260	6.934	4.096
2446.18	1.379	0.0002212	6.801	4.088
2450.98	1.379	0.0002140	6.593	4.080
2455.80	1.379	0.0002056	6.345	4.072
2460.63	1.379	0.0002015	6.232	4.064
2465.48	1.379	0.0001954	6.054	4.056
2470.36	1.379	0.0001930	5.991	4.048
2475.25	1.379	0.0001936	6.022	4.040
2480.16	1.380	0.0001944	6.059	4.032
2485.09	1.380	0.0002008	6.272	4.024
2490.04	1.380	0.0002066	6.466	4.016
2495.01	1.380	0.0002184	6.847	4.008
2500.00	1.380	0.0002323	7.297	4.000
2505.01	1.380	0.0002452	7.719	3.992
2510.04	1.380	0.0002631	8.299	3.984
2515.09	1.380	0.0002801	8.852	3.976
2520.16	1.380	0.0002990	9.471	3.968

1-HEXENE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
2525.25	1.380	0.0003154	10.008	3.960
2530.36	1.380	0.0003308	10.520	3.952
2535.50	1.380	0.0003670	11.693	3.944
2540.65	1.380	0.0003687	11.772	3.936
2545.83	1.380	0.0003779	12.088	3.928
2551.02	1.380	0.0003925	12.583	3.920
2556.24	1.381	0.0004119	13.231	3.912
2561.48	1.381	0.0004279	13.773	3.904
2566.74	1.381	0.0004460	14.387	3.896
2572.02	1.381	0.0004654	15.041	3.888
2577.32	1.381	0.0004777	15.472	3.880
2582.65	1.381	0.0004899	15.898	3.872
2587.99	1.381	0.0004992	16.236	3.864
2593.36	1.381	0.0005036	16.412	3.856
2598.75	1.381	0.0005109	16.683	3.848
2604.17	1.381	0.0005194	16.996	3.840
2609.60	1.381	0.0005299	17.378	3.832
2615.06	1.381	0.0005481	18.010	3.824
2620.55	1.381	0.0005709	18.801	3.816
2637.13	1.382	0.0005800	19.221	3.792
2642.71	1.382	0.0006286	20.877	3.784
2648.31	1.382	0.0006609	21.994	3.776
2653.93	1.382	0.0006923	23.088	3.768
2659.57	1.382	0.0007322	24.472	3.760
2665.25	1.382	0.0007515	25.171	3.752
2670.94	1.382	0.0007396	24.825	3.744
2676.66	1.383	0.0007104	23.895	3.736
2682.40	1.383	0.0006848	23.084	3.728
2688.17	1.383	0.0006789	22.932	3.720
2693.97	1.383	0.0006789	22.984	3.712
2699.78	1.383	0.0006987	23.704	3.704
2705.63	1.384	0.0007280	24.753	3.696
2711.50	1.384	0.0008023	27.337	3.688
2717.39	1.384	0.0008681	29.645	3.680
2723.31	1.384	0.0009177	31.404	3.672
2729.26	1.385	0.0009613	32.971	3.664
2735.23	1.385	0.0009913	34.073	3.656
2741.23	1.385	0.0010084	34.738	3.648
2747.25	1.386	0.0010220	35.282	3.640
2753.30	1.386	0.0010478	36.254	3.632
2759.38	1.387	0.0011141	38.630	3.624
2765.49	1.387	0.0012051	41.879	3.616
2771.62	1.388	0.0013315	46.374	3.608
2777.78	1.388	0.0016067	56.085	3.600
2783.96	1.389	0.0017098	59.815	3.592
2790.18	1.390	0.0020372	71.428	3.584
2796.42	1.391	0.0023175	81.438	3.576
2802.69	1.392	0.0027143	95.598	3.568
2808.99	1.393	0.0029658	104.689	3.560
2815.32	1.395	0.0042470	150.253	3.552
2821.67	1.397	0.0058306	206.741	3.544
2828.05	1.399	0.0088004	312.753	3.536
2834.47	1.400	0.0118626	422.536	3.528
2840.91	1.400	0.0155649	555.667	3.520
2847.38	1.398	0.0195235	698.575	3.512
2853.88	1.395	0.0206651	741.111	3.504

1-HEXENE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
2860.41	1.393	0.0219709	789.743	3.496
2866.97	1.391	0.0221709	798.762	3.488
2873.56	1.390	0.0220838	797.452	3.480
2880.18	1.390	0.0225599	816.518	3.472
2886.84	1.391	0.0239228	867.851	3.464
2893.52	1.390	0.0260091	945.717	3.456
2900.23	1.390	0.0285465	1040.386	3.448
2906.98	1.389	0.0321418	1174.146	3.440
2913.75	1.385	0.0359471	1316.214	3.432
2920.56	1.381	0.0378924	1390.684	3.424
2927.40	1.375	0.0403468	1484.229	3.416
2934.27	1.368	0.0397191	1464.569	3.408
2941.18	1.362	0.0363728	1344.336	3.400
2948.11	1.357	0.0320329	1186.726	3.392
2955.08	1.354	0.0262065	973.167	3.384
2962.09	1.352	0.0214361	797.909	3.376
2969.12	1.352	0.0161466	602.447	3.368
2976.19	1.353	0.0119042	445.215	3.360
2983.29	1.354	0.0083628	313.515	3.352
2990.43	1.356	0.0056239	211.340	3.344
2997.60	1.358	0.0041457	156.163	3.336
3004.81	1.360	0.0030061	113.509	3.328
3012.05	1.362	0.0023249	88.000	3.320
3019.32	1.364	0.0019677	74.659	3.312
3026.63	1.365	0.0020283	77.142	3.304
3033.98	1.367	0.0024179	92.185	3.296
3041.36	1.368	0.0030591	116.915	3.288
3048.78	1.368	0.0038084	145.909	3.280
3056.24	1.368	0.0043704	167.850	3.272
3063.73	1.367	0.0045244	174.190	3.264
3071.25	1.367	0.0041539	160.318	3.256
3078.82	1.367	0.0034988	135.367	3.248
3086.42	1.367	0.0027932	108.336	3.240
3094.06	1.367	0.0021874	85.049	3.232
3101.74	1.367	0.0016370	63.805	3.224
3109.45	1.368	0.0009536	37.261	3.216
3117.21	1.368	0.0007830	30.670	3.208
3125.00	1.369	0.0006559	25.756	3.200
3132.83	1.369	0.0006291	24.768	3.192
3140.70	1.370	0.0005832	23.018	3.184
3148.62	1.370	0.0005575	22.057	3.176
3156.57	1.370	0.0005272	20.911	3.168
3164.56	1.370	0.0004943	19.657	3.160
3172.59	1.371	0.0004700	18.738	3.152
3180.66	1.371	0.0004328	17.299	3.144
3188.78	1.371	0.0003958	15.859	3.136
3196.93	1.371	0.0003609	14.501	3.128
3205.13	1.371	0.0003194	12.866	3.120
3213.37	1.371	0.0002835	11.447	3.112
3221.65	1.372	0.0002567	10.391	3.104
3229.97	1.372	0.0002310	9.378	3.096
3238.34	1.372	0.0002080	8.466	3.088
3246.75	1.372	0.0001936	7.899	3.080
3255.21	1.372	0.0001792	7.331	3.072
3263.71	1.372	0.0001628	6.679	3.064
3272.25	1.373	0.0001522	6.260	3.056

1-HEXENE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
3280.84	1.373	0.0001418	5.844	3.048
3289.47	1.373	0.0001355	5.602	3.040
3298.15	1.373	0.0001301	5.391	3.032
3306.88	1.373	0.0001244	5.171	3.024
3315.65	1.373	0.0001235	5.148	3.016
3324.47	1.373	0.0001197	5.003	3.008
3333.33	1.373	0.0001180	4.943	3.000
3342.25	1.373	0.0001171	4.918	2.992
3351.21	1.373	0.0001156	4.866	2.984
3360.22	1.374	0.0001115	4.708	2.976
3369.27	1.374	0.0001084	4.588	2.968
3378.38	1.374	0.0001054	4.474	2.960
3387.53	1.374	0.0001024	4.357	2.952
3396.74	1.374	0.0000989	4.220	2.944
3406.00	1.374	0.0000972	4.158	2.936
3415.30	1.374	0.0000933	4.004	2.928
3424.66	1.374	0.0000899	3.869	2.920
3434.07	1.374	0.0000845	3.646	2.912
3443.53	1.374	0.0000789	3.416	2.904
3453.04	1.374	0.0000746	3.237	2.896
3462.60	1.374	0.0000708	3.079	2.888
3472.22	1.374	0.0000674	2.939	2.880
3481.89	1.374	0.0000645	2.823	2.872
3491.62	1.374	0.0000640	2.809	2.864
3501.40	1.374	0.0000644	2.834	2.856
3511.24	1.375	0.0000663	2.926	2.848
3521.13	1.375	0.0000663	2.932	2.840
3531.07	1.375	0.0000673	2.988	2.832
3541.08	1.375	0.0000683	3.040	2.824
3551.14	1.375	0.0000689	3.073	2.816
3561.25	1.375	0.0000696	3.115	2.808
3571.43	1.375	0.0000736	3.304	2.800
3581.66	1.375	0.0000783	3.526	2.792
3591.95	1.375	0.0000844	3.811	2.784
3602.31	1.375	0.0000945	4.280	2.776
3612.72	1.375	0.0001018	4.620	2.768
3623.19	1.375	0.0001087	4.948	2.760
3633.72	1.375	0.0001142	5.213	2.752
3644.32	1.375	0.0001177	5.389	2.744
3654.97	1.375	0.0001186	5.448	2.736
3665.69	1.375	0.0001196	5.507	2.728
3676.47	1.375	0.0001207	5.577	2.720
3687.32	1.375	0.0001196	5.540	2.712
3698.23	1.375	0.0001203	5.591	2.704
3709.20	1.375	0.0001210	5.639	2.696
3720.24	1.375	0.0001219	5.697	2.688
3731.34	1.375	0.0001234	5.788	2.680
3742.52	1.375	0.0001269	5.969	2.672
3753.75	1.375	0.0001295	6.110	2.664
3765.06	1.376	0.0001334	6.314	2.656
3776.44	1.376	0.0001367	6.488	2.648
3787.88	1.376	0.0001392	6.627	2.640
3799.39	1.376	0.0001416	6.759	2.632
3810.98	1.376	0.0001408	6.743	2.624
3822.63	1.376	0.0001433	6.884	2.616
3834.36	1.376	0.0001397	6.730	2.608

1-HEXENE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
3846.15	1.376	0.0001376	6.650	2.600
3858.03	1.376	0.0001384	6.710	2.592
3869.97	1.376	0.0001318	6.410	2.584
3881.99	1.376	0.0001256	6.129	2.576
3894.08	1.376	0.0001354	6.628	2.568
3906.25	1.376	0.0001372	6.733	2.560
4000.00	1.376	0.0003277	16.470	2.500
4185.85	1.376	0.0005058	26.606	2.389
4337.34	1.376	0.0006164	33.594	2.306
4390.20	1.376	0.0002101	11.590	2.278
4444.44	1.376	0.0002522	14.087	2.250
4500.05	1.376	0.0000790	4.465	2.222
4615.31	1.377	0.0000612	3.551	2.167
4675.30	1.377	0.0001246	7.318	2.139
4800.08	1.377	0.0000426	2.572	2.083
5000.00	1.377	0.0000447	2.810	2.000

o-XYLENE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
666.67	1.526	0.0011512	9.644	15.000
678.18	1.532	0.0015315	13.051	14.745
683.23	1.536	0.0017306	14.859	14.636
689.66	1.539	0.0025232	18.697	14.500
695.36	1.543	0.0027446	23.982	14.381
711.46	1.575	0.0048116	43.018	14.056
714.29	1.589	0.0121901	109.419	14.000
715.92	1.590	0.0132163	118.901	13.968
716.74	1.593	0.0134622	121.252	13.952
717.57	1.597	0.0158283	142.728	13.936
719.22	1.602	0.0172081	155.527	13.904
720.05	1.606	0.0186079	168.372	13.888
721.71	1.614	0.0215081	195.063	13.856
723.38	1.626	0.0228473	207.688	13.824
724.22	1.637	0.0262086	238.520	13.808
725.06	1.643	0.0396668	361.419	13.792
725.90	1.644	0.0408403	372.542	13.776
726.74	1.651	0.0432902	395.347	13.760
727.59	1.657	0.0514588	470.497	13.744
728.44	1.665	0.0509611	466.490	13.728
729.29	1.675	0.0628264	575.774	13.712
730.14	1.685	0.0653981	600.041	13.696
730.99	1.697	0.0796640	731.785	13.680
731.85	1.707	0.0890372	818.848	13.664
732.71	1.724	0.0988851	910.486	13.648
733.57	1.743	0.1242469	1145.347	13.632
734.43	1.752	0.1499097	1383.535	13.616
735.29	1.770	0.1671493	1544.447	13.600
736.16	1.796	0.2129610	1970.072	13.584
737.03	1.784	0.2828308	2619.520	13.568
737.90	1.788	0.2814888	2610.168	13.552
738.77	1.817	0.3804763	3532.212	13.536
739.65	1.765	0.4954611	4605.170	13.520
740.52	1.690	0.5445368	5067.268	13.504
741.40	1.540	0.6590555	6140.227	13.488
742.28	1.375	0.5432456	5067.268	13.472
743.16	1.295	0.4931210	4605.170	13.456
744.05	1.243	0.3777764	3532.212	13.440
744.93	1.225	0.3279662	3070.113	13.424
745.82	1.229	0.2335647	2189.027	13.408
746.71	1.245	0.2271398	2131.351	13.392
747.61	1.243	0.1724499	1620.123	13.376
748.50	1.255	0.1555101	1462.717	13.360
749.40	1.265	0.1206954	1136.617	13.344
750.30	1.277	0.1117646	1053.778	13.328
751.20	1.286	0.0891181	841.262	13.312
752.11	1.287	0.0874798	826.797	13.296
753.01	1.291	0.0506985	479.740	13.280
753.92	1.313	0.0395530	374.726	13.264
754.83	1.324	0.0363676	344.964	13.248
755.74	1.334	0.0214021	203.254	13.232
756.66	1.349	0.0190208	180.858	13.216
757.58	1.359	0.0164060	156.185	13.200

o-XYLENE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
758.50	1.367	0.0147654	140.738	13.184
759.42	1.374	0.0120100	114.614	13.168
760.34	1.381	0.0098811	94.411	13.152
761.27	1.388	0.0091717	87.741	13.136
762.20	1.393	0.0085813	82.192	13.120
763.13	1.398	0.0064443	61.799	13.104
764.06	1.404	0.0063262	60.741	13.088
764.99	1.408	0.0065086	62.568	13.072
765.93	1.412	0.0061039	58.749	13.056
768.76	1.421	0.0062049	59.943	13.008
769.70	1.423	0.0058164	56.258	12.992
771.60	1.428	0.0056513	54.796	12.960
772.56	1.430	0.0057079	55.414	12.944
774.47	1.434	0.0057307	55.773	12.912
775.43	1.435	0.0050376	49.088	12.896
776.40	1.437	0.0048642	47.458	12.880
778.33	1.440	0.0047416	46.377	12.848
779.30	1.441	0.0041101	40.250	12.832
780.27	1.443	0.0044370	43.506	12.816
781.25	1.444	0.0037155	36.476	12.800
782.23	1.445	0.0036147	35.531	12.784
783.21	1.446	0.0033169	32.646	12.768
784.19	1.448	0.0027874	27.468	12.752
786.16	1.450	0.0027275	26.946	12.720
787.15	1.452	0.0027960	27.657	12.704
789.14	1.454	0.0027736	27.505	12.672
791.14	1.455	0.0027375	27.216	12.640
792.14	1.456	0.0027185	27.060	12.624
793.15	1.457	0.0026132	26.046	12.608
794.16	1.457	0.0024242	24.193	12.592
795.17	1.458	0.0020782	20.767	12.576
796.18	1.459	0.0020149	20.160	12.560
802.31	1.463	0.0019545	19.705	12.464
803.34	1.464	0.0019590	19.776	12.448
805.41	1.465	0.0018870	19.098	12.416
806.45	1.466	0.0016411	16.631	12.400
807.49	1.466	0.0016226	16.465	12.384
808.54	1.467	0.0015242	15.486	12.368
810.64	1.468	0.0014351	14.619	12.336
812.74	1.469	0.0014314	14.619	12.304
813.80	1.470	0.0017667	18.068	12.288
814.86	1.470	0.0018034	18.467	12.272
815.93	1.471	0.0018126	18.585	12.256
816.99	1.471	0.0020202	20.741	12.240
818.06	1.472	0.0020534	21.109	12.224
820.21	1.472	0.0020734	21.371	12.192
821.29	1.473	0.0022624	23.350	12.176
822.37	1.473	0.0024741	25.568	12.160
823.45	1.474	0.0026347	27.263	12.144
824.54	1.474	0.0028513	29.543	12.128
825.63	1.474	0.0031946	33.145	12.112
826.72	1.474	0.0030983	32.188	12.096
827.81	1.474	0.0028203	29.339	12.080
828.91	1.474	0.0026145	27.234	12.064
830.01	1.474	0.0023287	24.288	12.048
831.12	1.475	0.0021817	22.786	12.032

o-XYLENE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
832.22	1.475	0.0019598	20.495	12.016
833.33	1.475	0.0017131	17.940	12.000
837.80	1.477	0.0017164	18.070	11.936
838.93	1.477	0.0019172	20.211	11.920
840.05	1.478	0.0018930	19.983	11.904
843.45	1.479	0.0019661	20.839	11.856
844.59	1.479	0.0019430	20.622	11.840
845.74	1.479	0.0020174	21.441	11.824
848.03	1.480	0.0020944	22.320	11.792
849.18	1.480	0.0022572	24.087	11.776
850.34	1.481	0.0024850	26.554	11.760
851.50	1.481	0.0028765	30.780	11.744
852.66	1.481	0.0031020	33.237	11.728
853.83	1.481	0.0034290	36.792	11.712
856.16	1.481	0.0037329	40.161	11.680
857.34	1.481	0.0036531	39.357	11.664
859.70	1.480	0.0034628	37.409	11.632
860.88	1.481	0.0031111	33.656	11.616
862.07	1.481	0.0031334	33.944	11.600
863.26	1.481	0.0028732	31.169	11.584
864.45	1.481	0.0027273	29.627	11.568
865.65	1.481	0.0027390	29.795	11.552
866.85	1.481	0.0024504	26.693	11.536
868.06	1.481	0.0024422	26.640	11.520
869.26	1.481	0.0022596	24.683	11.504
870.47	1.482	0.0019843	21.706	11.488
871.69	1.482	0.0019226	21.060	11.472
875.35	1.483	0.0018331	20.164	11.424
876.58	1.483	0.0018437	20.309	11.408
884.02	1.484	0.0017926	19.914	11.312
887.78	1.485	0.0016106	17.968	11.264
891.58	1.485	0.0016340	18.308	11.216
892.86	1.485	0.0015904	17.845	11.200
894.13	1.486	0.0015520	17.438	11.184
895.42	1.486	0.0014859	16.719	11.168
901.88	1.487	0.0013923	15.780	11.088
903.18	1.487	0.0014127	16.034	11.072
909.75	1.488	0.0014064	16.079	10.992
912.41	1.489	0.0014292	16.387	10.960
913.74	1.489	0.0015654	17.975	10.944
915.08	1.490	0.0016904	19.438	10.928
916.42	1.490	0.0018679	21.511	10.912
917.77	1.490	0.0020711	23.886	10.896
919.12	1.490	0.0021405	24.723	10.880
920.47	1.490	0.0023071	26.686	10.864
921.83	1.491	0.0025478	29.514	10.848
923.19	1.491	0.0027155	31.503	10.832
924.56	1.491	0.0030584	35.533	10.816
925.93	1.491	0.0036607	42.594	10.800
927.30	1.491	0.0040389	47.064	10.784
928.68	1.491	0.0043110	50.310	10.768
930.06	1.491	0.0047644	55.684	10.752
931.45	1.490	0.0045146	52.843	10.736
932.84	1.490	0.0042383	49.683	10.720
934.23	1.490	0.0040490	47.535	10.704
935.63	1.490	0.0036067	42.405	10.688

o-XYLENE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
937.03	1.490	0.0033066	38.936	10.672
938.44	1.490	0.0031960	37.690	10.656
939.85	1.490	0.0030335	35.828	10.640
941.27	1.491	0.0028611	33.842	10.624
942.68	1.491	0.0028284	33.505	10.608
944.11	1.491	0.0026190	31.072	10.592
945.54	1.491	0.0024224	28.783	10.576
946.97	1.492	0.0023188	27.594	10.560
948.41	1.492	0.0021396	25.500	10.544
949.85	1.493	0.0020960	25.018	10.528
951.29	1.493	0.0022063	26.374	10.512
952.74	1.494	0.0022320	26.723	10.496
954.20	1.494	0.0024231	29.055	10.480
955.66	1.494	0.0025957	31.172	10.464
957.12	1.495	0.0026343	31.684	10.448
958.59	1.495	0.0028008	33.738	10.432
960.06	1.496	0.0028136	33.945	10.416
961.54	1.496	0.0030555	36.919	10.400
963.02	1.497	0.0032229	39.002	10.384
964.51	1.498	0.0039993	48.473	10.368
966.00	1.498	0.0042105	51.111	10.352
967.49	1.498	0.0043711	53.143	10.336
968.99	1.500	0.0042846	52.172	10.320
970.50	1.501	0.0068871	83.993	10.304
972.01	1.501	0.0073065	89.246	10.288
973.52	1.501	0.0088722	108.539	10.272
975.04	1.501	0.0092884	113.808	10.256
976.56	1.502	0.0108150	132.720	10.240
978.09	1.501	0.0134453	165.256	10.224
979.62	1.500	0.0144826	178.285	10.208
981.16	1.499	0.0170114	209.744	10.192
982.70	1.496	0.0180374	222.743	10.176
984.25	1.493	0.0164214	203.107	10.160
985.80	1.492	0.0146931	182.017	10.144
987.36	1.491	0.0134116	166.405	10.128
988.92	1.491	0.0110910	137.829	10.112
990.49	1.492	0.0114953	143.080	10.096
992.06	1.492	0.0102514	127.800	10.080
993.64	1.493	0.0099837	124.661	10.064
995.22	1.494	0.0099978	125.035	10.048
996.81	1.494	0.0098457	123.330	10.032
998.40	1.495	0.0101432	127.259	10.016
1000.00	1.496	0.0100209	125.927	10.000
1001.60	1.497	0.0105297	132.532	9.984
1003.21	1.498	0.0115146	145.162	9.968
1004.82	1.499	0.0119071	150.351	9.952
1006.44	1.499	0.0144112	182.263	9.936
1008.07	1.499	0.0142318	180.285	9.920
1009.69	1.500	0.0164928	209.263	9.904
1011.33	1.501	0.0185681	235.977	9.888
1012.97	1.501	0.0209733	266.977	9.872
1014.61	1.500	0.0247606	315.696	9.856
1016.26	1.497	0.0287282	366.879	9.840
1017.92	1.493	0.0306807	392.453	9.824
1019.58	1.486	0.0333261	426.988	9.808
1021.24	1.480	0.0282289	362.270	9.792

o-XYLENE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
1022.91	1.477	0.0231123	297.092	9.776
1024.59	1.477	0.0187196	241.023	9.760
1026.27	1.479	0.0157547	203.180	9.744
1027.96	1.480	0.0148143	191.367	9.728
1029.65	1.481	0.0132526	171.475	9.712
1031.35	1.482	0.0120038	155.573	9.696
1033.06	1.483	0.0117602	152.669	9.680
1034.77	1.484	0.0115256	149.871	9.664
1036.48	1.485	0.0107778	140.378	9.648
1038.21	1.486	0.0113201	147.688	9.632
1039.93	1.487	0.0116926	152.801	9.616
1041.67	1.489	0.0120602	157.869	9.600
1043.41	1.491	0.0142196	186.446	9.584
1045.15	1.492	0.0174465	229.138	9.568
1046.90	1.492	0.0225644	296.852	9.552
1048.66	1.486	0.0302708	398.904	9.536
1050.42	1.476	0.0292254	385.774	9.520
1052.19	1.470	0.0230885	305.282	9.504
1053.96	1.468	0.0172889	228.982	9.488
1055.74	1.469	0.0122573	162.616	9.472
1057.53	1.469	0.0102844	136.672	9.456
1059.32	1.470	0.0044368	59.062	9.440
1061.12	1.473	0.0035229	46.977	9.424
1062.93	1.475	0.0026412	35.278	9.408
1064.74	1.477	0.0020235	27.074	9.392
1066.55	1.478	0.0020063	26.890	9.376
1068.38	1.479	0.0018508	24.848	9.360
1070.21	1.480	0.0017207	23.141	9.344
1072.04	1.481	0.0016408	22.104	9.328
1073.88	1.481	0.0013423	18.114	9.312
1075.73	1.482	0.0010941	14.790	9.296
1077.59	1.483	0.0010499	14.217	9.280
1086.96	1.485	0.0010818	14.776	9.200
1090.75	1.487	0.0010632	14.574	9.168
1092.66	1.487	0.0012085	16.594	9.152
1094.57	1.488	0.0016026	22.044	9.136
1096.49	1.488	0.0016674	22.976	9.120
1098.42	1.489	0.0017421	24.046	9.104
1100.35	1.489	0.0018650	25.788	9.088
1102.29	1.490	0.0019359	26.816	9.072
1104.24	1.491	0.0026195	36.349	9.056
1106.20	1.492	0.0032746	45.519	9.040
1108.16	1.493	0.0032310	44.994	9.024
1110.12	1.495	0.0054250	75.679	9.008
1112.10	1.496	0.0080837	112.970	8.992
1114.08	1.495	0.0135988	190.382	8.976
1116.07	1.490	0.0178725	250.661	8.960
1118.07	1.483	0.0151913	213.439	8.944
1120.07	1.481	0.0107535	151.358	8.928
1122.08	1.481	0.0089101	125.637	8.912
1124.10	1.482	0.0062955	88.929	8.896
1126.13	1.483	0.0054083	76.534	8.880
1128.16	1.483	0.0047275	67.021	8.864
1130.20	1.484	0.0040295	57.229	8.848
1132.25	1.484	0.0036337	51.702	8.832
1134.30	1.485	0.0036981	52.713	8.816

o-XYLENE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
1136.36	1.485	0.0038044	54.327	8.800
1138.43	1.485	0.0040471	57.898	8.784
1140.51	1.485	0.0038663	55.412	8.768
1142.60	1.485	0.0033450	48.029	8.752
1144.69	1.485	0.0025821	37.142	8.736
1146.79	1.486	0.0019553	28.178	8.720
1153.14	1.487	0.0016547	23.978	8.672
1155.27	1.488	0.0020355	29.550	8.656
1157.41	1.488	0.0022544	32.790	8.640
1159.56	1.488	0.0026858	39.136	8.624
1161.71	1.489	0.0029678	43.325	8.608
1163.87	1.489	0.0034842	50.959	8.592
1166.05	1.488	0.0034586	50.679	8.576
1168.22	1.488	0.0036191	53.130	8.560
1170.41	1.488	0.0037166	54.663	8.544
1172.61	1.488	0.0038533	56.780	8.528
1174.81	1.488	0.0035077	51.784	8.512
1177.02	1.488	0.0034919	51.648	8.496
1179.25	1.488	0.0034215	50.703	8.480
1181.47	1.488	0.0030904	45.882	8.464
1183.71	1.488	0.0029645	44.096	8.448
1185.96	1.487	0.0027153	40.467	8.432
1188.21	1.487	0.0021948	32.772	8.416
1190.48	1.488	0.0017631	26.376	8.400
1195.03	1.489	0.0017478	26.248	8.368
1197.32	1.489	0.0016888	25.410	8.352
1201.92	1.489	0.0015260	23.049	8.320
1206.56	1.490	0.0016834	25.523	8.288
1208.90	1.490	0.0018716	28.433	8.272
1211.24	1.491	0.0022095	33.630	8.256
1213.59	1.491	0.0024298	37.055	8.240
1215.95	1.491	0.0036513	55.792	8.224
1218.32	1.491	0.0047394	72.560	8.208
1220.70	1.489	0.0048490	74.383	8.192
1223.09	1.488	0.0042004	64.559	8.176
1225.49	1.488	0.0031790	48.957	8.160
1227.90	1.488	0.0018184	28.058	8.144
1230.32	1.489	0.0014592	22.560	8.128
1232.74	1.489	0.0014211	22.015	8.112
1235.18	1.489	0.0012461	19.341	8.096
1237.62	1.490	0.0010935	17.006	8.080
1240.08	1.490	0.0009567	14.908	8.064
1245.02	1.491	0.0009324	14.588	8.032
1250.00	1.491	0.0009532	14.972	8.000
1257.55	1.492	0.0009493	15.002	7.952
1260.08	1.492	0.0011759	18.621	7.936
1262.63	1.492	0.0012255	19.445	7.920
1265.18	1.492	0.0012217	19.423	7.904
1267.75	1.493	0.0013250	21.109	7.888
1270.33	1.493	0.0015199	24.264	7.872
1272.91	1.493	0.0016655	26.641	7.856
1275.51	1.493	0.0018239	29.235	7.840
1278.12	1.493	0.0018329	29.439	7.824
1280.74	1.493	0.0020547	33.069	7.808
1283.37	1.493	0.0023257	37.508	7.792
1291.32	1.493	0.0021211	34.420	7.744

o-XYLENE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
1294.00	1.493	0.0019054	30.984	7.728
1296.68	1.493	0.0017877	29.130	7.712
1299.38	1.494	0.0016614	27.128	7.696
1302.08	1.494	0.0015740	25.755	7.680
1304.80	1.494	0.0015058	24.690	7.664
1307.53	1.494	0.0014913	24.504	7.648
1310.27	1.495	0.0016681	27.466	7.632
1315.79	1.495	0.0016363	27.056	7.600
1318.57	1.495	0.0016562	27.442	7.584
1321.35	1.496	0.0017204	28.567	7.568
1324.15	1.496	0.0018220	30.317	7.552
1326.96	1.496	0.0019834	33.073	7.536
1329.79	1.496	0.0019510	32.602	7.520
1332.62	1.497	0.0020047	33.570	7.504
1338.33	1.497	0.0021060	35.418	7.472
1341.20	1.498	0.0021380	36.034	7.456
1344.09	1.498	0.0025519	43.102	7.440
1346.98	1.499	0.0026604	45.031	7.424
1349.89	1.499	0.0025764	43.704	7.408
1352.81	1.500	0.0025789	43.841	7.392
1355.75	1.501	0.0027872	47.485	7.376
1358.70	1.502	0.0032402	55.323	7.360
1361.66	1.503	0.0047452	81.195	7.344
1364.63	1.504	0.0063531	108.945	7.328
1367.62	1.504	0.0084220	144.740	7.312
1370.61	1.504	0.0099034	170.571	7.296
1373.63	1.503	0.0123290	212.818	7.280
1376.65	1.500	0.0146296	253.085	7.264
1379.69	1.496	0.0134878	233.847	7.248
1382.74	1.494	0.0109598	190.437	7.232
1385.81	1.494	0.0080118	139.523	7.216
1388.89	1.495	0.0057985	101.203	7.200
1391.98	1.497	0.0048990	85.694	7.184
1395.09	1.498	0.0046868	82.165	7.168
1398.21	1.500	0.0046425	81.571	7.152
1401.35	1.501	0.0046059	81.109	7.136
1404.49	1.503	0.0052360	92.412	7.120
1407.66	1.504	0.0056752	100.390	7.104
1410.84	1.506	0.0062374	110.584	7.088
1414.03	1.507	0.0075527	134.205	7.072
1417.23	1.508	0.0086736	154.472	7.056
1420.46	1.510	0.0094662	168.972	7.040
1423.69	1.514	0.0110249	197.243	7.024
1426.94	1.516	0.0175600	314.876	7.008
1430.21	1.515	0.0206852	371.766	6.992
1433.49	1.515	0.0247245	445.381	6.976
1436.78	1.513	0.0294349	531.451	6.960
1440.09	1.511	0.0318613	576.585	6.944
1443.42	1.509	0.0362879	658.210	6.928
1446.76	1.506	0.0382960	696.241	6.912
1450.12	1.503	0.0432692	788.484	6.896
1453.49	1.498	0.0448215	818.670	6.880
1456.88	1.491	0.0484783	887.526	6.864
1460.28	1.482	0.0478089	877.314	6.848
1463.70	1.474	0.0435993	801.940	6.832
1467.14	1.469	0.0347388	640.466	6.816

o-XYLENE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
1470.59	1.469	0.0264812	489.373	6.800
1474.06	1.472	0.0217304	402.524	6.784
1477.54	1.477	0.0191514	355.589	6.768
1481.04	1.481	0.0221291	411.852	6.752
1484.56	1.483	0.0265325	494.978	6.736
1488.10	1.478	0.0349129	652.872	6.720
1491.65	1.466	0.0349073	654.324	6.704
1495.22	1.458	0.0260113	488.739	6.688
1498.80	1.457	0.0162169	305.438	6.672
1502.40	1.460	0.0082993	156.689	6.656
1506.02	1.466	0.0046586	88.165	6.640
1516.99	1.473	0.0043696	83.299	6.592
1520.68	1.474	0.0042489	81.194	6.576
1524.39	1.475	0.0040840	78.234	6.560
1528.12	1.476	0.0035172	67.541	6.544
1531.86	1.477	0.0033095	63.707	6.528
1543.21	1.480	0.0035907	69.632	6.480
1547.03	1.480	0.0038869	75.564	6.464
1550.87	1.480	0.0042437	82.704	6.448
1554.73	1.480	0.0039682	77.528	6.432
1558.60	1.481	0.0038929	76.246	6.416
1562.50	1.481	0.0038327	75.256	6.400
1566.42	1.481	0.0038084	74.965	6.384
1570.35	1.482	0.0041956	82.795	6.368
1574.31	1.482	0.0041647	82.391	6.352
1578.28	1.482	0.0040033	79.398	6.336
1582.28	1.482	0.0043210	85.916	6.320
1586.29	1.483	0.0044988	89.678	6.304
1590.33	1.483	0.0057345	114.603	6.288
1594.39	1.482	0.0068833	137.913	6.272
1598.47	1.480	0.0064816	130.195	6.256
1602.56	1.479	0.0052823	106.376	6.240
1606.68	1.479	0.0030495	61.571	6.224
1610.83	1.480	0.0024872	50.347	6.208
1614.99	1.481	0.0020138	40.869	6.192
1619.17	1.481	0.0018479	37.599	6.176
1623.38	1.481	0.0015395	31.405	6.160
1627.60	1.482	0.0011890	24.319	6.144
1631.85	1.482	0.0008877	18.204	6.128
1636.13	1.483	0.0007528	15.478	6.112
1640.42	1.483	0.0008573	17.673	6.096
1644.74	1.484	0.0010719	22.155	6.080
1649.08	1.484	0.0011894	24.648	6.064
1653.44	1.484	0.0011317	23.514	6.048
1657.83	1.484	0.0011871	24.731	6.032
1662.23	1.484	0.0013787	28.799	6.016
1666.67	1.484	0.0016724	35.026	6.000
1671.12	1.484	0.0018165	38.146	5.984
1675.60	1.484	0.0016040	33.774	5.968
1680.11	1.484	0.0011409	24.087	5.952
1684.64	1.484	0.0007752	16.411	5.936
1689.19	1.485	0.0007605	16.144	5.920
1693.77	1.485	0.0010102	21.501	5.904
1698.37	1.485	0.0011840	25.270	5.888
1703.00	1.485	0.0011165	23.894	5.872
1707.65	1.485	0.0009108	19.545	5.856

o-XYLENE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
1712.33	1.485	0.0008517	18.327	5.840
1717.03	1.485	0.0008979	19.375	5.824
1721.76	1.485	0.0009062	19.608	5.808
1726.52	1.486	0.0007509	16.292	5.792
1731.30	1.486	0.0005013	10.906	5.776
1736.11	1.486	0.0004457	9.724	5.760
1740.95	1.486	0.0006240	13.651	5.744
1745.81	1.486	0.0007221	15.842	5.728
1750.70	1.487	0.0007129	15.685	5.712
1755.62	1.487	0.0006323	13.950	5.696
1760.56	1.487	0.0007952	17.593	5.680
1765.54	1.487	0.0012459	27.641	5.664
1770.54	1.487	0.0017843	39.700	5.648
1775.57	1.487	0.0021924	48.917	5.632
1780.63	1.486	0.0022126	49.508	5.616
1785.71	1.486	0.0017226	38.654	5.600
1790.83	1.486	0.0011912	26.807	5.584
1795.98	1.486	0.0008996	20.302	5.568
1801.15	1.487	0.0007723	17.481	5.552
1806.36	1.487	0.0006930	15.731	5.536
1811.59	1.487	0.0007509	17.094	5.520
1816.86	1.487	0.0010391	23.723	5.504
1822.16	1.487	0.0012829	29.375	5.488
1827.49	1.487	0.0011433	26.256	5.472
1832.85	1.487	0.0008286	19.085	5.456
1838.24	1.488	0.0007609	17.577	5.440
1843.66	1.488	0.0010175	23.573	5.424
1849.11	1.488	0.0013105	30.452	5.408
1851.85	1.488	0.0011906	27.706	5.400
1854.60	1.488	0.0013146	30.638	5.392
1857.36	1.488	0.0013406	31.291	5.384
1860.12	1.488	0.0013476	31.500	5.376
1862.89	1.488	0.0012931	30.271	5.368
1865.67	1.488	0.0012311	28.862	5.360
1868.46	1.488	0.0012420	29.161	5.352
1871.26	1.488	0.0012906	30.348	5.344
1874.06	1.488	0.0014196	33.431	5.336
1876.88	1.488	0.0015723	37.083	5.328
1879.70	1.488	0.0016871	39.850	5.320
1882.53	1.488	0.0018517	43.805	5.312
1885.37	1.488	0.0020128	47.689	5.304
1888.22	1.488	0.0021555	51.146	5.296
1891.07	1.488	0.0023009	54.677	5.288
1893.94	1.487	0.0024052	57.245	5.280
1896.81	1.487	0.0023394	55.762	5.272
1899.70	1.487	0.0022122	52.811	5.264
1902.59	1.487	0.0019457	46.519	5.256
1905.49	1.487	0.0016125	38.611	5.248
1908.40	1.487	0.0013249	31.773	5.240
1911.32	1.487	0.0010243	24.603	5.232
1914.24	1.487	0.0008076	19.426	5.224
1917.18	1.487	0.0007029	16.933	5.216
1920.12	1.487	0.0006964	16.803	5.208
1923.08	1.488	0.0007890	19.067	5.200
1926.04	1.488	0.0009894	23.946	5.192
1929.01	1.488	0.0011843	28.708	5.184

o-XYLENE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
1931.99	1.488	0.0013562	32.927	5.176
1934.99	1.488	0.0014680	35.695	5.168
1937.98	1.487	0.0014708	35.818	5.160
1940.99	1.487	0.0013966	34.066	5.152
1944.01	1.487	0.0012938	31.606	5.144
1947.04	1.487	0.0011428	27.961	5.136
1950.08	1.487	0.0010257	25.135	5.128
1953.13	1.487	0.0008859	21.743	5.120
1956.18	1.487	0.0007322	17.999	5.112
1959.25	1.487	0.0006172	15.197	5.104
1962.32	1.487	0.0005337	13.162	5.096
1965.41	1.487	0.0004724	11.666	5.088
1968.50	1.487	0.0004317	10.678	5.080
1971.61	1.487	0.0003958	9.805	5.072
1974.72	1.487	0.0003714	9.217	5.064
1977.85	1.488	0.0003499	8.696	5.056
1980.98	1.488	0.0003294	8.201	5.048
1984.13	1.488	0.0003024	7.540	5.040
1987.28	1.488	0.0002809	7.014	5.032
1990.45	1.488	0.0002649	6.625	5.024
1993.62	1.488	0.0002419	6.061	5.016
1996.81	1.488	0.0002280	5.722	5.008
2000.00	1.488	0.0002176	5.469	5.000
2003.21	1.488	0.0002099	5.285	4.992
2006.42	1.488	0.0002110	5.320	4.984
2009.65	1.488	0.0002111	5.330	4.976
2012.88	1.488	0.0002088	5.281	4.968
2016.13	1.488	0.0002072	5.250	4.960
2019.39	1.488	0.0001986	5.039	4.952
2022.65	1.488	0.0001930	4.905	4.944
2025.93	1.488	0.0001863	4.744	4.936
2029.22	1.488	0.0001811	4.617	4.928
2032.52	1.488	0.0001788	4.567	4.920
2035.83	1.488	0.0001765	4.515	4.912
2039.15	1.488	0.0001714	4.391	4.904
2042.48	1.488	0.0001655	4.248	4.896
2045.83	1.488	0.0001512	3.886	4.888
2049.18	1.488	0.0001339	3.448	4.880
2052.55	1.488	0.0001205	3.107	4.872
2055.92	1.488	0.0001068	2.759	4.864
2059.31	1.489	0.0001008	2.607	4.856
2062.71	1.489	0.0001025	2.658	4.848
2066.12	1.489	0.0001056	2.742	4.840
2069.54	1.489	0.0001153	2.998	4.832
2072.97	1.489	0.0001254	3.265	4.824
2076.41	1.489	0.0001301	3.396	4.816
2079.87	1.489	0.0001401	3.662	4.808
2083.33	1.489	0.0001461	3.826	4.800
2086.81	1.489	0.0001567	4.109	4.792
2090.30	1.489	0.0001722	4.524	4.784
2093.80	1.489	0.0001879	4.943	4.776
2097.32	1.489	0.0002092	5.513	4.768
2100.84	1.489	0.0002240	5.913	4.760
2104.38	1.489	0.0002307	6.102	4.752
2107.93	1.489	0.0002294	6.077	4.744
2111.49	1.489	0.0002114	5.608	4.736

o-XYLENE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
2115.06	1.489	0.0001870	4.971	4.728
2118.64	1.489	0.0001572	4.186	4.720
2122.24	1.489	0.0001308	3.487	4.712
2125.85	1.489	0.0001120	2.991	4.704
2129.47	1.489	0.0000996	2.665	4.696
2133.11	1.489	0.0000947	2.537	4.688
2136.75	1.489	0.0001000	2.686	4.680
2140.41	1.489	0.0001088	2.925	4.672
2144.08	1.489	0.0001164	3.137	4.664
2147.77	1.489	0.0001262	3.407	4.656
2151.46	1.489	0.0001330	3.597	4.648
2155.17	1.489	0.0001369	3.708	4.640
2158.90	1.489	0.0001325	3.594	4.632
2162.63	1.489	0.0001328	3.609	4.624
2166.38	1.489	0.0001299	3.537	4.616
2170.14	1.489	0.0001290	3.517	4.608
2173.91	1.489	0.0001379	3.767	4.600
2177.70	1.489	0.0001514	4.143	4.592
2181.50	1.490	0.0001728	4.736	4.584
2185.32	1.490	0.0001989	5.462	4.576
2189.14	1.490	0.0002244	6.173	4.568
2192.98	1.490	0.0002446	6.742	4.560
2196.84	1.490	0.0002578	7.116	4.552
2200.70	1.490	0.0002594	7.173	4.544
2204.59	1.490	0.0002565	7.107	4.536
2208.48	1.490	0.0002434	6.754	4.528
2212.39	1.490	0.0002255	6.269	4.520
2216.31	1.490	0.0002148	5.982	4.512
2220.25	1.490	0.0002035	5.678	4.504
2224.20	1.490	0.0001897	5.302	4.496
2228.16	1.490	0.0001802	5.047	4.488
2232.14	1.490	0.0001671	4.688	4.480
2236.14	1.490	0.0001582	4.445	4.472
2240.14	1.490	0.0001568	4.414	4.464
2244.17	1.490	0.0001618	4.563	4.456
2248.20	1.490	0.0001743	4.923	4.448
2252.25	1.490	0.0001965	5.563	4.440
2256.32	1.490	0.0002216	6.284	4.432
2260.40	1.490	0.0002455	6.973	4.424
2264.49	1.490	0.0002675	7.614	4.416
2268.60	1.490	0.0002793	7.963	4.408
2272.73	1.490	0.0002737	7.818	4.400
2276.87	1.490	0.0002620	7.497	4.392
2281.02	1.490	0.0002434	6.977	4.384
2285.19	1.490	0.0002255	6.476	4.376
2289.38	1.490	0.0002253	6.483	4.368
2293.58	1.490	0.0002222	6.405	4.360
2297.79	1.490	0.0002308	6.663	4.352
2302.03	1.490	0.0002402	6.948	4.344
2306.27	1.490	0.0002522	7.310	4.336
2310.54	1.490	0.0002656	7.712	4.328
2314.82	1.490	0.0002784	8.099	4.320
2319.11	1.490	0.0002831	8.251	4.312
2323.42	1.490	0.0002924	8.538	4.304
2327.75	1.490	0.0002952	8.636	4.296
2332.09	1.490	0.0003035	8.896	4.288

o-XYLENE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
2336.45	1.490	0.0002837	8.330	4.280
2340.82	1.490	0.0002666	7.841	4.272
2345.22	1.490	0.0002447	7.210	4.264
2349.62	1.490	0.0002237	6.604	4.256
2354.05	1.490	0.0001992	5.893	4.248
2358.49	1.490	0.0001835	5.438	4.240
2362.95	1.490	0.0001898	5.637	4.232
2367.42	1.490	0.0001999	5.947	4.224
2371.92	1.491	0.0002083	6.209	4.216
2376.43	1.491	0.0002295	6.852	4.208
2380.95	1.491	0.0002531	7.572	4.200
2385.50	1.491	0.0002759	8.272	4.192
2390.06	1.491	0.0003038	9.124	4.184
2394.64	1.491	0.0003387	10.193	4.176
2399.23	1.491	0.0003711	11.189	4.168
2403.85	1.491	0.0004032	12.179	4.160
2408.48	1.491	0.0004284	12.967	4.152
2413.13	1.491	0.0004534	13.748	4.144
2417.80	1.491	0.0004644	14.109	4.136
2422.48	1.491	0.0004728	14.394	4.128
2427.18	1.491	0.0004740	14.457	4.120
2431.91	1.491	0.0004615	14.103	4.112
2436.65	1.491	0.0004436	13.581	4.104
2441.41	1.491	0.0004124	12.653	4.096
2446.18	1.491	0.0003749	11.524	4.088
2450.98	1.491	0.0003464	10.670	4.080
2455.80	1.491	0.0003129	9.655	4.072
2460.63	1.491	0.0002853	8.821	4.064
2465.48	1.491	0.0002635	8.162	4.056
2470.36	1.491	0.0002486	7.719	4.048
2475.25	1.491	0.0002378	7.397	4.040
2480.16	1.491	0.0002291	7.140	4.032
2485.09	1.491	0.0002244	7.008	4.024
2490.04	1.491	0.0002185	6.838	4.016
2495.01	1.491	0.0002122	6.653	4.008
2500.00	1.491	0.0002070	6.502	4.000
2505.01	1.491	0.0001980	6.234	3.992
2510.04	1.491	0.0001861	5.870	3.984
2515.09	1.491	0.0001765	5.580	3.976
2520.16	1.491	0.0001733	5.489	3.968
2525.25	1.491	0.0001752	5.559	3.960
2530.36	1.491	0.0001823	5.797	3.952
2535.50	1.491	0.0002023	6.447	3.944
2540.65	1.491	0.0002358	7.529	3.936
2545.83	1.492	0.0002766	8.848	3.928
2551.02	1.492	0.0003248	10.413	3.920
2556.24	1.492	0.0003761	12.080	3.912
2561.48	1.492	0.0004190	13.486	3.904
2566.74	1.492	0.0004423	14.267	3.896
2572.02	1.492	0.0004422	14.291	3.888
2577.32	1.492	0.0004262	13.802	3.880
2582.65	1.492	0.0003952	12.826	3.872
2587.99	1.492	0.0003612	11.746	3.864
2593.36	1.492	0.0003328	10.846	3.856
2598.75	1.492	0.0003047	9.950	3.848
2604.17	1.492	0.0002758	9.025	3.840

o-XYLENE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
2609.60	1.492	0.0002497	8.188	3.832
2615.06	1.492	0.0002295	7.542	3.824
2620.55	1.492	0.0002116	6.967	3.816
2626.05	1.492	0.0002013	6.642	3.808
2631.58	1.492	0.0001992	6.588	3.800
2637.13	1.492	0.0001999	6.625	3.792
2642.71	1.492	0.0002102	6.981	3.784
2648.31	1.492	0.0002251	7.492	3.776
2653.93	1.492	0.0002415	8.054	3.768
2659.57	1.493	0.0002596	8.675	3.760
2665.25	1.493	0.0002803	9.389	3.752
2670.94	1.493	0.0002982	10.010	3.744
2676.66	1.493	0.0002979	10.019	3.736
2682.40	1.493	0.0003252	10.962	3.728
2688.17	1.493	0.0003623	12.239	3.720
2693.97	1.493	0.0004155	14.067	3.712
2699.78	1.493	0.0004814	16.333	3.704
2705.63	1.493	0.0005699	19.376	3.696
2711.50	1.494	0.0006673	22.737	3.688
2717.39	1.494	0.0007793	26.610	3.680
2723.31	1.494	0.0010813	37.006	3.672
2729.26	1.494	0.0010688	36.657	3.664
2735.23	1.494	0.0010229	35.159	3.656
2741.23	1.494	0.0009467	32.610	3.648
2747.25	1.494	0.0008801	30.384	3.640
2753.30	1.494	0.0008180	28.300	3.632
2759.38	1.494	0.0008020	27.810	3.624
2765.49	1.494	0.0008048	27.970	3.616
2771.62	1.495	0.0008407	29.281	3.608
2777.78	1.495	0.0008884	31.012	3.600
2783.96	1.495	0.0009811	34.324	3.592
2790.18	1.495	0.0010919	38.284	3.584
2796.42	1.496	0.0012478	43.850	3.576
2802.69	1.496	0.0015770	55.543	3.568
2808.99	1.496	0.0016875	59.565	3.560
2815.32	1.497	0.0020008	70.784	3.552
2821.67	1.497	0.0023471	83.225	3.544
2828.05	1.498	0.0028272	100.473	3.536
2834.47	1.499	0.0037690	134.249	3.528
2840.91	1.499	0.0049983	178.438	3.520
2847.38	1.498	0.0063701	227.929	3.512
2860.41	1.497	0.0068598	246.574	3.496
2866.97	1.497	0.0074210	267.358	3.488
2873.56	1.497	0.0078678	284.107	3.480
2880.18	1.497	0.0080739	292.220	3.472
2886.84	1.497	0.0086350	313.254	3.464
2893.52	1.497	0.0094286	342.833	3.456
2900.23	1.497	0.0104396	380.477	3.448
2906.98	1.496	0.0116085	424.061	3.440
2913.75	1.496	0.0128537	470.642	3.432
2920.56	1.494	0.0137857	505.948	3.424
2927.40	1.492	0.0142668	524.831	3.416
2934.27	1.491	0.0142513	525.492	3.408
2941.18	1.489	0.0136506	504.526	3.400
2948.11	1.487	0.0127282	471.541	3.392
2955.08	1.486	0.0116096	431.118	3.384

o-XYLENE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
2962.09	1.486	0.0104804	390.110	3.376
2969.12	1.485	0.0093532	348.979	3.368
2976.19	1.485	0.0083118	310.859	3.360
2983.29	1.486	0.0075775	284.076	3.352
2990.43	1.486	0.0071108	267.216	3.344
2997.60	1.486	0.0069331	261.163	3.336
3004.81	1.486	0.0069508	262.460	3.328
3012.05	1.486	0.0070077	265.243	3.320
3019.32	1.486	0.0070725	268.343	3.312
3026.63	1.486	0.0071877	273.376	3.304
3033.98	1.486	0.0072338	275.795	3.296
3041.36	1.485	0.0070597	269.813	3.288
3048.78	1.484	0.0067485	258.551	3.280
3056.24	1.484	0.0061388	235.768	3.272
3063.73	1.483	0.0053160	204.666	3.264
3071.25	1.483	0.0042053	162.302	3.256
3078.82	1.483	0.0037802	146.256	3.248
3086.42	1.483	0.0029857	115.801	3.240
3094.06	1.483	0.0023021	89.510	3.232
3101.74	1.484	0.0016984	66.198	3.224
3109.45	1.484	0.0012075	47.182	3.216
3117.21	1.485	0.0009363	36.678	3.208
3125.00	1.485	0.0007213	28.326	3.200
3132.83	1.485	0.0006253	24.616	3.192
3140.70	1.486	0.0005340	21.076	3.184
3148.62	1.486	0.0004591	18.165	3.176
3156.57	1.486	0.0003850	15.270	3.168
3164.56	1.486	0.0003257	12.952	3.160
3172.59	1.486	0.0002812	11.210	3.152
3180.66	1.487	0.0002295	9.173	3.144
3188.78	1.487	0.0001973	7.907	3.136
3196.93	1.487	0.0001638	6.582	3.128
3205.13	1.487	0.0001330	5.355	3.120
3213.37	1.487	0.0001077	4.347	3.112
3221.65	1.487	0.0000842	3.410	3.104
3229.97	1.487	0.0000701	2.845	3.096
3238.34	1.488	0.0000576	2.343	3.088
3246.75	1.488	0.0000476	1.943	3.080
3255.21	1.488	0.0000422	1.724	3.072
3263.71	1.488	0.0000409	1.678	3.064
3272.25	1.488	0.0000375	1.541	3.056
3280.84	1.488	0.0000361	1.488	3.048
3298.15	1.488	0.0000345	1.430	3.032
3306.88	1.488	0.0000339	1.408	3.024
3342.25	1.489	0.0000355	1.493	2.992
3351.21	1.489	0.0000352	1.484	2.984
3360.22	1.489	0.0000336	1.421	2.976
3369.27	1.489	0.0000337	1.425	2.968
3387.53	1.489	0.0000339	1.444	2.952
3396.74	1.489	0.0000378	1.612	2.944
3406.00	1.489	0.0000430	1.839	2.936
3415.30	1.489	0.0000479	2.058	2.928
3424.66	1.489	0.0000548	2.357	2.920
3434.07	1.489	0.0000611	2.635	2.912
3443.53	1.489	0.0000637	2.756	2.904
3453.04	1.489	0.0000645	2.799	2.896

o-XYLENE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
3462.60	1.489	0.0000635	2.763	2.888
3472.22	1.489	0.0000592	2.582	2.880
3481.89	1.489	0.0000544	2.379	2.872
3491.62	1.489	0.0000520	2.282	2.864
3501.40	1.489	0.0000500	2.201	2.856
3511.24	1.489	0.0000517	2.281	2.848
3521.13	1.489	0.0000558	2.469	2.840
3531.07	1.489	0.0000634	2.813	2.832
3541.08	1.490	0.0000717	3.192	2.824
3551.14	1.490	0.0000800	3.570	2.816
3561.25	1.490	0.0000883	3.953	2.808
3571.43	1.490	0.0000937	4.206	2.800
3581.66	1.490	0.0000952	4.285	2.792
3591.95	1.490	0.0000925	4.175	2.784
3602.31	1.490	0.0000888	4.018	2.776
3612.72	1.490	0.0000828	3.761	2.768
3623.19	1.490	0.0000789	3.593	2.760
3633.72	1.490	0.0000750	3.424	2.752
3644.32	1.490	0.0000721	3.303	2.744
3654.97	1.490	0.0000710	3.259	2.736
3665.69	1.490	0.0000707	3.257	2.728
3676.47	1.490	0.0000734	3.391	2.720
3687.32	1.490	0.0000759	3.517	2.712
3698.23	1.490	0.0000814	3.783	2.704
3709.20	1.490	0.0000882	4.111	2.696
3720.24	1.490	0.0000976	4.564	2.688
3731.34	1.490	0.0001065	4.994	2.680
3742.52	1.490	0.0001179	5.547	2.672
3753.75	1.490	0.0001263	5.960	2.664
3765.06	1.490	0.0001370	6.482	2.656
3776.44	1.490	0.0001509	7.162	2.648
3787.88	1.490	0.0001645	7.830	2.640
3799.39	1.490	0.0001980	9.453	2.632
3810.98	1.490	0.0002035	9.746	2.624
3822.63	1.490	0.0002267	10.891	2.616
3834.36	1.490	0.0002521	12.145	2.608
3846.15	1.490	0.0002751	13.296	2.600
3858.03	1.490	0.0002945	14.277	2.592
3869.97	1.490	0.0003086	15.005	2.584
3881.99	1.490	0.0003057	14.913	2.576
3894.08	1.490	0.0003072	15.031	2.568
3906.25	1.490	0.0003106	15.245	2.560
4000.00	1.490	0.0002597	13.051	2.500
4081.71	1.490	0.0003645	18.697	2.450
4127.65	1.491	0.0002865	14.859	2.423
4322.26	1.491	0.0005509	29.922	2.314
4564.36	1.491	0.0001261	7.234	2.191
4621.88	1.491	0.0001947	11.311	2.164
4867.27	1.491	0.0000393	2.401	2.055
5000.00	1.491	0.0000215	1.353	2.000

TOLUENE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
400.00	1.512	0.0012034	6.049	25.000
416.67	1.520	0.0011552	6.049	24.000
454.55	1.553	0.0213718	122.076	22.000
461.68	1.598	0.0628917	364.875	21.660
464.04	1.637	0.1122380	654.493	21.550
466.42	1.539	0.2642135	1548.610	21.440
468.82	1.389	0.1110937	654.493	21.330
471.25	1.407	0.0616146	364.875	21.220
476.19	1.433	0.0135909	81.328	21.000
480.19	1.456	0.0087269	52.660	20.825
486.62	1.470	0.0048009	29.358	20.550
504.41	1.487	0.0020232	12.824	19.825
510.07	1.491	0.0013816	8.855	19.605
514.40	1.494	0.0019839	12.824	19.440
517.33	1.496	0.0027979	18.189	19.330
518.81	1.497	0.0045030	29.358	19.275
521.78	1.494	0.0074260	48.691	19.165
524.80	1.492	0.0044516	29.358	19.055
526.32	1.493	0.0032774	21.676	19.000
531.21	1.495	0.0019211	12.824	18.825
540.69	1.498	0.0014456	9.822	18.495
545.55	1.499	0.0010166	6.969	18.330
555.56	1.502	0.0008013	5.594	18.000
588.24	1.511	0.0005751	4.251	17.000
602.23	1.516	0.0006796	5.143	16.605
606.24	1.518	0.0009148	6.969	16.495
614.44	1.522	0.0016609	12.824	16.275
618.62	1.524	0.0026358	20.490	16.165
622.86	1.528	0.0035778	28.004	16.055
631.91	1.523	0.0140762	111.777	15.825
636.33	1.522	0.0019980	15.977	15.715
638.57	1.528	0.0021275	17.072	15.660
647.67	1.537	0.0026633	21.676	15.440
657.03	1.569	0.0035557	29.358	15.220
691.39	1.571	0.1323163	1149.599	14.464
694.01	1.612	0.2160631	1884.327	14.409
696.65	1.421	0.1313173	1149.599	14.354
699.30	1.415	0.0744787	654.493	14.300
701.98	1.443	0.0413628	364.875	14.245
706.03	1.491	0.0223809	198.568	14.164
708.76	1.523	0.0207944	185.206	14.109
711.51	1.562	0.0222085	198.568	14.055
714.29	1.597	0.0510505	458.231	14.000
715.10	1.603	0.0574212	515.999	13.984
715.92	1.608	0.0645809	581.003	13.968
716.74	1.618	0.0631912	569.152	13.952
717.57	1.636	0.0725130	653.868	13.936
718.39	1.649	0.0885638	799.515	13.920
719.22	1.659	0.0983393	888.789	13.904
720.05	1.681	0.1059529	958.706	13.888
720.88	1.700	0.1416926	1283.571	13.872
721.71	1.718	0.1566779	1420.955	13.856
722.54	1.760	0.2004728	1820.234	13.840

TOLUENE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
723.38	1.739	0.3172237	2883.646	13.824
724.22	1.684	0.3208983	2920.437	13.808
725.06	1.665	0.3470906	3162.472	13.792
725.90	1.650	0.3626313	3307.897	13.776
726.74	1.681	0.3867745	3532.212	13.760
727.59	1.659	0.5542137	5067.268	13.744
728.44	1.461	0.6707810	6140.227	13.728
729.29	1.254	0.5529218	5067.268	13.712
730.14	1.215	0.3849734	3532.212	13.696
730.99	1.232	0.3504152	3218.876	13.680
731.85	1.198	0.3130366	2878.903	13.664
732.71	1.200	0.2153587	1982.916	13.648
733.57	1.237	0.1948556	1796.240	13.632
734.43	1.242	0.1873224	1728.821	13.616
735.29	1.238	0.1568875	1449.629	13.600
736.16	1.254	0.1254867	1160.860	13.584
737.03	1.267	0.1206934	1117.837	13.568
737.90	1.273	0.1021372	947.090	13.552
738.77	1.285	0.0894623	830.538	13.536
739.65	1.298	0.0823550	765.466	13.520
740.52	1.304	0.0807245	751.193	13.504
741.40	1.307	0.0735605	685.342	13.488
742.28	1.313	0.0648572	604.973	13.472
743.16	1.321	0.0608106	567.899	13.456
744.05	1.326	0.0586860	548.715	13.440
744.93	1.328	0.0582328	545.121	13.424
745.82	1.326	0.0559815	524.672	13.408
746.71	1.316	0.0509152	477.759	13.392
747.61	1.321	0.0195328	183.505	13.376
748.50	1.339	0.0176680	166.184	13.360
749.40	1.347	0.0168654	158.826	13.344
750.30	1.353	0.0139208	131.253	13.328
751.20	1.360	0.0124333	117.369	13.312
752.11	1.364	0.0123584	116.803	13.296
753.01	1.369	0.0086593	81.940	13.280
754.83	1.378	0.0074465	70.633	13.248
755.74	1.382	0.0060466	57.424	13.232
756.66	1.386	0.0056949	54.150	13.216
757.58	1.389	0.0046525	44.292	13.200
758.50	1.392	0.0042925	40.914	13.184
759.42	1.395	0.0033240	31.721	13.168
760.34	1.399	0.0028690	27.412	13.152
761.27	1.402	0.0027928	26.717	13.136
764.06	1.409	0.0024554	23.575	13.088
765.93	1.414	0.0027279	26.256	13.056
766.87	1.416	0.0029660	28.583	13.040
767.81	1.418	0.0032916	31.759	13.024
768.76	1.420	0.0036826	35.576	13.008
769.70	1.421	0.0037604	36.372	12.992
770.65	1.423	0.0041561	40.249	12.976
771.60	1.424	0.0043552	42.229	12.960
772.56	1.425	0.0046451	45.096	12.944
773.51	1.427	0.0045276	44.009	12.928
774.47	1.428	0.0051255	49.883	12.912
775.43	1.429	0.0052819	51.468	12.896
776.40	1.430	0.0051651	50.393	12.880

TOLUENE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
777.36	1.431	0.0058391	57.040	12.864
778.33	1.432	0.0058350	57.071	12.848
779.30	1.433	0.0062588	61.292	12.832
780.27	1.433	0.0072978	71.557	12.816
781.25	1.434	0.0068750	67.495	12.800
782.23	1.434	0.0081066	79.686	12.784
783.21	1.434	0.0082422	81.121	12.768
784.19	1.434	0.0073164	72.099	12.752
785.18	1.434	0.0074215	73.227	12.736
786.16	1.434	0.0063087	62.325	12.720
787.15	1.435	0.0053795	53.212	12.704
788.15	1.435	0.0050283	49.801	12.688
789.14	1.436	0.0035076	34.783	12.672
790.14	1.437	0.0036023	35.767	12.656
791.14	1.438	0.0031231	31.049	12.640
792.14	1.439	0.0029988	29.851	12.624
793.15	1.440	0.0029052	28.956	12.608
794.16	1.441	0.0025227	25.176	12.592
795.17	1.441	0.0023138	23.121	12.576
796.18	1.442	0.0021310	21.320	12.560
798.21	1.444	0.0020344	20.406	12.528
806.45	1.449	0.0019310	19.569	12.400
814.86	1.453	0.0018386	18.827	12.272
818.06	1.454	0.0018109	18.616	12.224
826.72	1.458	0.0018858	19.591	12.096
827.81	1.458	0.0022521	23.428	12.080
828.91	1.459	0.0023160	24.125	12.064
830.01	1.459	0.0023475	24.484	12.048
831.12	1.459	0.0025672	26.813	12.032
832.22	1.459	0.0026246	27.448	12.016
833.33	1.460	0.0025797	27.014	12.000
834.45	1.460	0.0025970	27.232	11.984
835.56	1.460	0.0029327	30.793	11.968
836.68	1.461	0.0029473	30.988	11.952
837.80	1.461	0.0032070	33.764	11.936
838.93	1.461	0.0036048	38.003	11.920
840.05	1.461	0.0035538	37.515	11.904
841.18	1.461	0.0036254	38.322	11.888
843.45	1.461	0.0035702	37.841	11.856
844.59	1.461	0.0031464	33.395	11.840
845.74	1.461	0.0030335	32.240	11.824
846.88	1.461	0.0027834	29.621	11.808
848.03	1.461	0.0023603	25.153	11.792
850.34	1.462	0.0022777	24.339	11.760
852.66	1.463	0.0021732	23.286	11.728
853.83	1.463	0.0022123	23.737	11.712
854.99	1.463	0.0020388	21.905	11.696
856.16	1.464	0.0020084	21.608	11.680
857.34	1.464	0.0019225	20.712	11.664
858.52	1.464	0.0017258	18.618	11.648
862.07	1.465	0.0016909	18.318	11.600
863.26	1.466	0.0016889	18.321	11.584
864.45	1.466	0.0019146	20.798	11.568
865.65	1.466	0.0020910	22.746	11.552
866.85	1.466	0.0020921	22.790	11.536
868.06	1.467	0.0022685	24.746	11.520

TOLUENE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
869.26	1.467	0.0023226	25.370	11.504
870.47	1.467	0.0021056	23.033	11.488
871.69	1.467	0.0021046	23.054	11.472
872.91	1.467	0.0020284	22.250	11.456
874.13	1.468	0.0018903	20.765	11.440
875.35	1.468	0.0019549	21.504	11.424
876.58	1.468	0.0020403	22.475	11.408
877.81	1.469	0.0020727	22.864	11.392
879.04	1.469	0.0021576	23.833	11.376
880.28	1.469	0.0023223	25.690	11.360
881.52	1.470	0.0023056	25.540	11.344
882.77	1.470	0.0024866	27.585	11.328
884.02	1.470	0.0026525	29.467	11.312
885.27	1.471	0.0029290	32.584	11.296
886.52	1.471	0.0032282	35.963	11.280
887.78	1.472	0.0039936	44.553	11.264
889.05	1.472	0.0045504	50.838	11.248
890.31	1.472	0.0054829	61.343	11.232
891.58	1.471	0.0066645	74.668	11.216
895.42	1.468	0.0064885	73.010	11.168
896.70	1.468	0.0053144	59.885	11.152
897.99	1.468	0.0045582	51.437	11.136
899.28	1.468	0.0042037	47.504	11.120
900.58	1.468	0.0035228	39.867	11.104
901.88	1.469	0.0033923	38.446	11.088
903.18	1.469	0.0030955	35.133	11.072
904.49	1.469	0.0029860	33.939	11.056
905.80	1.469	0.0027667	31.492	11.040
907.11	1.469	0.0026551	30.266	11.024
908.43	1.470	0.0023889	27.271	11.008
909.75	1.470	0.0022252	25.440	10.992
911.08	1.470	0.0021445	24.552	10.976
915.08	1.471	0.0021189	24.366	10.928
917.77	1.472	0.0022086	25.472	10.896
919.12	1.472	0.0021701	25.064	10.880
921.83	1.472	0.0021857	25.320	10.848
923.19	1.472	0.0021568	25.022	10.832
924.56	1.473	0.0022595	26.251	10.816
925.93	1.473	0.0023629	27.494	10.800
927.30	1.473	0.0023972	27.934	10.784
928.68	1.473	0.0025389	29.629	10.768
931.45	1.473	0.0025102	29.381	10.736
932.84	1.473	0.0025573	29.978	10.720
934.23	1.474	0.0024866	29.192	10.704
935.63	1.474	0.0023936	28.143	10.688
937.03	1.474	0.0024803	29.205	10.672
938.44	1.474	0.0024700	29.129	10.656
939.85	1.474	0.0025831	30.507	10.640
941.27	1.474	0.0027832	32.921	10.624
942.68	1.474	0.0027843	32.983	10.608
944.11	1.474	0.0028617	33.951	10.592
945.54	1.474	0.0021834	25.943	10.576
946.97	1.475	0.0019488	23.191	10.560
948.41	1.475	0.0020102	23.957	10.544
951.29	1.476	0.0020894	24.977	10.512
952.74	1.476	0.0021758	26.050	10.496

TOLUENE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
954.20	1.477	0.0025213	30.232	10.480
955.66	1.477	0.0032619	39.173	10.464
957.12	1.477	0.0033552	40.355	10.448
958.59	1.477	0.0036061	43.439	10.432
960.06	1.477	0.0041888	50.536	10.416
961.54	1.477	0.0042206	50.998	10.400
963.02	1.477	0.0045423	54.970	10.384
964.51	1.476	0.0044037	53.374	10.368
966.00	1.476	0.0041241	50.063	10.352
967.49	1.476	0.0041246	50.146	10.336
968.99	1.476	0.0033883	41.259	10.320
972.01	1.477	0.0033202	40.555	10.288
975.04	1.477	0.0035373	43.342	10.256
978.09	1.478	0.0034694	42.642	10.224
981.16	1.478	0.0034862	42.984	10.192
984.25	1.479	0.0034582	42.772	10.160
985.80	1.479	0.0041550	51.472	10.144
987.36	1.479	0.0043072	53.441	10.128
988.92	1.478	0.0041936	52.114	10.112
993.64	1.479	0.0040679	50.793	10.064
995.22	1.479	0.0037622	47.051	10.048
998.40	1.479	0.0034642	43.463	10.016
1000.00	1.479	0.0033814	42.492	10.000
1001.60	1.480	0.0028824	36.280	9.984
1003.21	1.481	0.0028690	36.169	9.968
1004.82	1.481	0.0028822	36.393	9.952
1006.44	1.482	0.0029863	37.769	9.936
1008.07	1.483	0.0034340	43.501	9.920
1009.69	1.484	0.0041142	52.201	9.904
1011.33	1.484	0.0044424	56.458	9.888
1012.97	1.485	0.0047309	60.222	9.872
1014.61	1.486	0.0056869	72.508	9.856
1016.26	1.486	0.0062214	79.452	9.840
1017.92	1.487	0.0062891	80.447	9.824
1019.58	1.489	0.0081172	104.001	9.808
1021.24	1.491	0.0097167	124.697	9.792
1022.91	1.492	0.0133134	171.135	9.776
1024.59	1.492	0.0189074	243.440	9.760
1026.27	1.488	0.0252632	325.807	9.744
1027.96	1.480	0.0267765	345.892	9.728
1029.65	1.474	0.0231261	299.228	9.712
1031.35	1.472	0.0182985	237.154	9.696
1033.06	1.473	0.0153877	199.760	9.680
1034.77	1.474	0.0150840	196.142	9.664
1036.48	1.473	0.0160663	209.260	9.648
1038.21	1.472	0.0148558	193.817	9.632
1039.93	1.471	0.0152616	199.440	9.616
1041.67	1.470	0.0123775	162.022	9.600
1043.41	1.469	0.0114594	150.254	9.584
1045.15	1.469	0.0093384	122.648	9.568
1046.90	1.470	0.0074229	97.654	9.552
1048.66	1.470	0.0063674	83.908	9.536
1050.42	1.472	0.0048228	63.661	9.520
1052.19	1.473	0.0042958	56.800	9.504
1053.96	1.474	0.0044106	58.416	9.488
1055.74	1.475	0.0042462	56.334	9.472

TOLUENE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
1057.53	1.476	0.0038310	50.912	9.456
1059.32	1.478	0.0042334	56.354	9.440
1061.12	1.478	0.0044907	59.881	9.424
1062.93	1.480	0.0045541	60.830	9.408
1064.74	1.481	0.0054411	72.801	9.392
1066.55	1.483	0.0072150	96.701	9.376
1068.38	1.484	0.0083326	111.870	9.360
1070.21	1.485	0.0111401	149.820	9.344
1072.04	1.485	0.0137478	185.206	9.328
1073.88	1.485	0.0174074	234.909	9.312
1075.73	1.484	0.0217603	294.157	9.296
1077.59	1.476	0.0319017	431.994	9.280
1079.45	1.464	0.0252881	343.027	9.264
1081.32	1.461	0.0175946	239.080	9.248
1083.19	1.461	0.0131613	179.148	9.232
1085.07	1.462	0.0089581	122.147	9.216
1086.96	1.463	0.0062244	85.020	9.200
1088.85	1.465	0.0046935	64.221	9.184
1090.75	1.467	0.0031569	43.270	9.168
1100.35	1.472	0.0035222	48.703	9.088
1102.29	1.472	0.0038151	52.846	9.072
1104.24	1.472	0.0036204	50.238	9.056
1106.20	1.471	0.0030563	42.485	9.040
1108.16	1.472	0.0022885	31.868	9.024
1114.08	1.474	0.0022401	31.362	8.976
1116.07	1.474	0.0023527	32.996	8.960
1118.07	1.474	0.0025869	36.346	8.944
1120.07	1.475	0.0026909	37.875	8.928
1122.08	1.475	0.0028238	39.816	8.912
1124.10	1.475	0.0026286	37.132	8.896
1126.13	1.475	0.0024723	34.986	8.880
1128.16	1.475	0.0023204	32.897	8.864
1130.20	1.475	0.0018077	25.674	8.848
1132.25	1.476	0.0020851	29.667	8.832
1136.36	1.476	0.0021195	30.266	8.800
1140.51	1.477	0.0022610	32.404	8.768
1142.60	1.477	0.0024005	34.467	8.752
1144.69	1.477	0.0029063	41.805	8.736
1146.79	1.477	0.0032631	47.025	8.720
1148.90	1.476	0.0033116	47.811	8.704
1151.01	1.476	0.0013478	19.495	8.688
1153.14	1.477	0.0018446	26.729	8.672
1155.27	1.478	0.0018861	27.381	8.656
1157.41	1.478	0.0020435	29.722	8.640
1159.56	1.479	0.0026040	37.944	8.624
1161.71	1.479	0.0025995	37.949	8.608
1163.87	1.479	0.0030827	45.086	8.592
1166.05	1.480	0.0036301	53.192	8.576
1168.22	1.480	0.0043887	64.428	8.560
1170.41	1.480	0.0057288	84.258	8.544
1172.61	1.479	0.0073244	107.929	8.528
1174.81	1.477	0.0078588	116.021	8.512
1177.02	1.475	0.0074889	110.768	8.496
1179.25	1.474	0.0058261	86.336	8.480
1181.47	1.474	0.0039915	59.261	8.464
1183.71	1.475	0.0029515	43.904	8.448

TOLUENE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
1188.21	1.476	0.0026299	39.268	8.416
1190.48	1.476	0.0024887	37.231	8.400
1192.75	1.476	0.0022559	33.813	8.384
1199.62	1.477	0.0022642	34.133	8.336
1201.92	1.478	0.0025406	38.372	8.320
1204.24	1.478	0.0027923	42.256	8.304
1206.56	1.477	0.0030553	46.325	8.288
1208.90	1.477	0.0028838	43.810	8.272
1211.24	1.477	0.0021434	32.625	8.256
1213.59	1.477	0.0015827	24.136	8.240
1215.95	1.478	0.0020595	31.470	8.224
1220.70	1.477	0.0018106	27.774	8.192
1223.09	1.477	0.0016215	24.922	8.176
1225.49	1.478	0.0012549	19.325	8.160
1232.74	1.479	0.0010929	16.931	8.112
1235.18	1.479	0.0012020	18.658	8.096
1237.62	1.479	0.0013123	20.410	8.080
1240.08	1.479	0.0013191	20.556	8.064
1242.55	1.479	0.0013589	21.218	8.048
1250.00	1.479	0.0012680	19.917	8.000
1252.51	1.479	0.0011072	17.426	7.984
1262.63	1.480	0.0009699	15.389	7.920
1265.18	1.480	0.0009612	15.282	7.904
1270.33	1.481	0.0010129	16.169	7.872
1275.51	1.481	0.0010165	16.293	7.840
1278.12	1.481	0.0009313	14.958	7.824
1283.37	1.481	0.0009234	14.892	7.792
1286.01	1.482	0.0010924	17.654	7.776
1288.66	1.482	0.0011026	17.856	7.760
1291.32	1.482	0.0011052	17.934	7.744
1294.00	1.482	0.0011611	18.880	7.728
1296.68	1.482	0.0012889	21.002	7.712
1299.38	1.482	0.0014646	23.914	7.696
1302.08	1.483	0.0014799	24.215	7.680
1304.80	1.483	0.0016106	26.408	7.664
1307.53	1.483	0.0018001	29.577	7.648
1310.27	1.483	0.0018227	30.012	7.632
1313.03	1.483	0.0017616	29.067	7.616
1315.79	1.483	0.0016596	27.442	7.600
1318.57	1.483	0.0016077	26.640	7.584
1321.35	1.483	0.0017010	28.245	7.568
1324.15	1.484	0.0018543	30.856	7.552
1326.96	1.484	0.0018449	30.763	7.536
1329.79	1.484	0.0018424	30.788	7.520
1332.62	1.484	0.0018686	31.292	7.504
1335.47	1.484	0.0018611	31.232	7.488
1338.33	1.485	0.0019076	32.081	7.472
1341.20	1.485	0.0020254	34.136	7.456
1344.09	1.485	0.0020245	34.194	7.440
1346.98	1.486	0.0021915	37.094	7.424
1349.89	1.486	0.0025317	42.945	7.408
1352.81	1.486	0.0026982	45.869	7.392
1358.70	1.487	0.0026980	46.065	7.360
1361.66	1.488	0.0034214	58.544	7.344
1364.63	1.488	0.0043074	73.866	7.328
1367.62	1.488	0.0059205	101.749	7.312

TOLUENE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
1379.69	1.485	0.0062534	108.419	7.248
1382.74	1.485	0.0052656	91.495	7.232
1385.81	1.485	0.0046123	80.322	7.216
1391.98	1.486	0.0047418	82.945	7.184
1395.09	1.487	0.0046412	81.367	7.168
1398.21	1.487	0.0044597	78.360	7.152
1401.35	1.488	0.0044702	78.719	7.136
1404.49	1.488	0.0045341	80.024	7.120
1407.66	1.489	0.0045296	80.126	7.104
1410.84	1.490	0.0052292	92.709	7.088
1414.03	1.491	0.0056802	100.932	7.072
1417.23	1.492	0.0066617	118.641	7.056
1420.46	1.492	0.0073849	131.821	7.040
1423.69	1.493	0.0081307	145.463	7.024
1426.94	1.494	0.0081442	146.038	7.008
1430.21	1.497	0.0092361	165.996	6.992
1433.49	1.499	0.0136264	245.462	6.976
1436.78	1.498	0.0189580	342.289	6.960
1440.09	1.496	0.0210575	381.072	6.944
1443.42	1.495	0.0235508	427.177	6.928
1446.76	1.492	0.0265855	483.338	6.912
1450.12	1.489	0.0292025	532.150	6.896
1453.49	1.484	0.0305077	557.225	6.880
1456.88	1.479	0.0293837	537.947	6.864
1460.28	1.475	0.0264148	484.724	6.848
1463.70	1.473	0.0231717	426.207	6.832
1467.14	1.472	0.0192464	354.838	6.816
1470.59	1.473	0.0162138	299.631	6.800
1474.06	1.475	0.0139885	259.117	6.784
1477.54	1.479	0.0130021	241.415	6.768
1481.04	1.483	0.0157138	292.455	6.752
1484.56	1.485	0.0239237	446.310	6.736
1488.10	1.477	0.0335276	626.966	6.720
1491.65	1.465	0.0318722	597.433	6.704
1495.22	1.457	0.0222241	417.580	6.688
1498.80	1.458	0.0111403	209.822	6.672
1502.40	1.462	0.0099568	187.981	6.656
1506.02	1.465	0.0066599	126.040	6.640
1509.66	1.467	0.0067479	128.015	6.624
1513.32	1.468	0.0072551	137.969	6.608
1516.99	1.468	0.0068313	130.225	6.592
1520.68	1.469	0.0063718	121.762	6.576
1524.39	1.469	0.0054857	105.084	6.560
1528.12	1.470	0.0048326	92.799	6.544
1531.86	1.470	0.0041794	80.453	6.528
1535.63	1.471	0.0034721	67.001	6.512
1539.41	1.472	0.0033166	64.160	6.496
1543.21	1.473	0.0034418	66.745	6.480
1550.87	1.474	0.0034189	66.631	6.448
1554.73	1.474	0.0033801	66.039	6.432
1558.60	1.475	0.0036842	72.159	6.416
1562.50	1.475	0.0042158	82.778	6.400
1566.42	1.475	0.0045468	89.501	6.384
1570.35	1.475	0.0047108	92.960	6.368
1578.28	1.476	0.0046927	93.071	6.336
1582.28	1.476	0.0050312	100.039	6.320

TOLUENE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
1586.29	1.476	0.0053452	106.550	6.304
1590.33	1.477	0.0068195	136.285	6.288
1594.39	1.475	0.0084256	168.813	6.272
1598.47	1.473	0.0082956	166.634	6.256
1602.56	1.471	0.0069319	139.596	6.240
1606.68	1.471	0.0049858	100.663	6.224
1610.83	1.472	0.0039147	79.243	6.208
1614.99	1.472	0.0035585	72.217	6.192
1619.17	1.472	0.0030471	62.001	6.176
1623.38	1.472	0.0022912	46.740	6.160
1627.60	1.472	0.0014971	30.620	6.144
1631.85	1.473	0.0008532	17.495	6.128
1636.13	1.474	0.0006054	12.448	6.112
1640.42	1.474	0.0006776	13.968	6.096
1644.74	1.475	0.0008182	16.912	6.080
1649.08	1.475	0.0008074	16.732	6.064
1653.44	1.475	0.0005985	12.436	6.048
1666.67	1.476	0.0005508	11.536	6.000
1671.12	1.476	0.0007111	14.933	5.984
1675.60	1.476	0.0006716	14.142	5.968
1680.11	1.476	0.0004311	9.101	5.952
1693.77	1.477	0.0004602	9.795	5.904
1698.37	1.477	0.0005797	12.373	5.888
1703.00	1.477	0.0005249	11.232	5.872
1712.33	1.478	0.0005219	11.229	5.840
1717.03	1.478	0.0009188	19.824	5.824
1721.76	1.478	0.0012990	28.107	5.808
1731.30	1.478	0.0012688	27.605	5.776
1736.11	1.478	0.0008250	17.999	5.760
1740.95	1.478	0.0007069	15.466	5.744
1745.81	1.478	0.0006453	14.158	5.728
1750.70	1.478	0.0006321	13.906	5.712
1765.54	1.479	0.0008529	18.922	5.664
1770.54	1.479	0.0011360	25.276	5.648
1775.57	1.479	0.0012923	28.834	5.632
1780.63	1.479	0.0015114	33.820	5.616
1785.71	1.480	0.0019022	42.685	5.600
1790.83	1.479	0.0024989	56.236	5.584
1795.98	1.479	0.0027466	61.989	5.568
1801.15	1.478	0.0023005	52.069	5.552
1806.36	1.478	0.0016776	38.080	5.536
1811.59	1.478	0.0012181	27.731	5.520
1816.86	1.479	0.0010395	23.733	5.504
1822.16	1.479	0.0010381	23.771	5.488
1827.49	1.479	0.0010409	23.904	5.472
1832.85	1.480	0.0011706	26.962	5.456
1838.24	1.480	0.0016261	37.562	5.440
1843.66	1.480	0.0024489	56.736	5.424
1849.11	1.479	0.0032991	76.660	5.408
1851.85	1.479	0.0028634	66.634	5.400
1854.60	1.479	0.0030250	70.499	5.392
1857.36	1.478	0.0030448	71.066	5.384
1860.12	1.478	0.0028721	67.135	5.376
1862.89	1.478	0.0026064	61.015	5.368
1865.67	1.478	0.0022935	53.770	5.360
1868.46	1.478	0.0019848	46.602	5.352

TOLUENE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
1871.26	1.478	0.0017875	42.033	5.344
1874.06	1.478	0.0015981	37.635	5.336
1876.88	1.478	0.0013705	32.324	5.328
1879.70	1.478	0.0011679	27.588	5.320
1882.53	1.478	0.0009542	22.572	5.312
1885.37	1.478	0.0006980	16.536	5.304
1888.22	1.478	0.0005049	11.980	5.296
1891.07	1.478	0.0003566	8.474	5.288
1893.94	1.478	0.0002818	6.708	5.280
1896.81	1.479	0.0002757	6.571	5.272
1899.70	1.479	0.0003094	7.386	5.264
1902.59	1.479	0.0003404	8.139	5.256
1905.49	1.479	0.0003795	9.087	5.248
1908.40	1.479	0.0003908	9.371	5.240
1911.32	1.479	0.0004276	10.271	5.232
1914.24	1.480	0.0004650	11.186	5.224
1917.18	1.480	0.0006035	14.539	5.216
1920.12	1.480	0.0008252	19.910	5.208
1923.08	1.480	0.0011183	27.026	5.200
1926.04	1.480	0.0015036	36.391	5.192
1929.01	1.480	0.0019167	46.462	5.184
1931.99	1.480	0.0023248	56.442	5.176
1934.99	1.480	0.0026253	63.837	5.168
1937.98	1.479	0.0027616	67.254	5.160
1940.99	1.479	0.0027959	68.194	5.152
1944.01	1.479	0.0026439	64.588	5.144
1947.04	1.478	0.0024575	60.128	5.136
1950.08	1.478	0.0022436	54.981	5.128
1953.13	1.478	0.0019507	47.878	5.120
1956.18	1.478	0.0016432	40.394	5.112
1959.25	1.478	0.0013353	32.876	5.104
1962.32	1.478	0.0009726	23.984	5.096
1965.41	1.478	0.0008453	20.877	5.088
1968.50	1.478	0.0007359	18.205	5.080
1971.61	1.478	0.0006756	16.738	5.072
1974.72	1.478	0.0006301	15.637	5.064
1977.85	1.478	0.0005997	14.906	5.056
1980.98	1.479	0.0005751	14.317	5.048
1984.13	1.479	0.0005429	13.538	5.040
1987.28	1.479	0.0005063	12.643	5.032
1990.45	1.479	0.0004676	11.696	5.024
1993.62	1.479	0.0004202	10.528	5.016
1996.81	1.479	0.0003772	9.465	5.008
2000.00	1.479	0.0003409	8.568	5.000
2003.21	1.479	0.0003052	7.682	4.992
2006.42	1.479	0.0002777	7.002	4.984
2009.65	1.479	0.0002461	6.215	4.976
2012.88	1.479	0.0002229	5.639	4.968
2016.13	1.479	0.0001951	4.943	4.960
2019.39	1.479	0.0001748	4.437	4.952
2022.65	1.479	0.0001539	3.911	4.944
2025.93	1.479	0.0001335	3.398	4.936
2029.22	1.479	0.0001193	3.042	4.928
2032.52	1.479	0.0001062	2.713	4.920
2035.83	1.479	0.0000959	2.453	4.912
2055.92	1.480	0.0000999	2.580	4.864

TOLUENE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
2069.54	1.480	0.0000993	2.582	4.832
2072.97	1.480	0.0000958	2.495	4.824
2076.41	1.480	0.0000892	2.327	4.816
2100.84	1.480	0.0000915	2.415	4.760
2104.38	1.480	0.0000953	2.521	4.752
2107.93	1.480	0.0000960	2.543	4.744
2111.49	1.480	0.0000946	2.511	4.736
2115.06	1.480	0.0000926	2.460	4.728
2136.75	1.480	0.0001019	2.736	4.680
2140.41	1.480	0.0001220	3.281	4.672
2144.08	1.481	0.0001462	3.939	4.664
2147.77	1.481	0.0001741	4.699	4.656
2151.46	1.481	0.0001978	5.349	4.648
2155.17	1.481	0.0002251	6.096	4.640
2158.90	1.481	0.0002346	6.365	4.632
2162.63	1.481	0.0002354	6.398	4.624
2166.38	1.481	0.0002279	6.205	4.616
2170.14	1.481	0.0002134	5.819	4.608
2173.91	1.481	0.0002015	5.503	4.600
2177.70	1.481	0.0001907	5.219	4.592
2181.50	1.481	0.0001811	4.966	4.584
2185.32	1.481	0.0001754	4.816	4.576
2189.14	1.481	0.0001716	4.722	4.568
2192.98	1.481	0.0001653	4.556	4.560
2196.84	1.481	0.0001593	4.397	4.552
2200.70	1.481	0.0001523	4.213	4.544
2204.59	1.481	0.0001470	4.073	4.536
2208.48	1.481	0.0001392	3.863	4.528
2212.39	1.481	0.0001347	3.745	4.520
2216.31	1.481	0.0001330	3.705	4.512
2220.25	1.481	0.0001327	3.702	4.504
2224.20	1.481	0.0001370	3.828	4.496
2228.16	1.481	0.0001491	4.175	4.488
2232.14	1.481	0.0001621	4.546	4.480
2236.14	1.481	0.0001834	5.152	4.472
2240.14	1.481	0.0002074	5.839	4.464
2244.17	1.481	0.0002322	6.549	4.456
2248.20	1.481	0.0002530	7.148	4.448
2252.25	1.481	0.0002710	7.671	4.440
2256.32	1.481	0.0002866	8.128	4.432
2260.40	1.481	0.0002955	8.393	4.424
2264.49	1.481	0.0002991	8.512	4.416
2268.60	1.481	0.0002996	8.540	4.408
2272.73	1.481	0.0002964	8.466	4.400
2276.87	1.481	0.0002898	8.291	4.392
2281.02	1.481	0.0002824	8.096	4.384
2285.19	1.481	0.0002773	7.962	4.376
2289.38	1.481	0.0002834	8.154	4.368
2293.58	1.481	0.0002864	8.255	4.360
2297.79	1.481	0.0002945	8.502	4.352
2302.03	1.481	0.0002968	8.587	4.344
2306.27	1.481	0.0003096	8.973	4.336
2310.54	1.481	0.0003234	9.390	4.328
2314.82	1.481	0.0003328	9.681	4.320
2319.11	1.481	0.0003430	9.996	4.312
2323.42	1.481	0.0003514	10.260	4.304

TOLUENE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
2327.75	1.481	0.0003554	10.396	4.296
2332.09	1.481	0.0003598	10.543	4.288
2336.45	1.481	0.0003559	10.450	4.280
2340.82	1.481	0.0003508	10.320	4.272
2345.22	1.481	0.0003343	9.851	4.264
2349.62	1.481	0.0003190	9.419	4.256
2354.05	1.481	0.0002934	8.679	4.248
2358.49	1.481	0.0002859	8.474	4.240
2362.95	1.481	0.0002852	8.468	4.232
2367.42	1.481	0.0002867	8.529	4.224
2371.92	1.482	0.0002898	8.639	4.216
2376.43	1.482	0.0003076	9.186	4.208
2380.95	1.482	0.0003269	9.780	4.200
2385.50	1.482	0.0003413	10.232	4.192
2390.06	1.482	0.0003545	10.648	4.184
2394.64	1.482	0.0003674	11.056	4.176
2399.23	1.482	0.0003746	11.295	4.168
2403.85	1.482	0.0003736	11.284	4.160
2408.48	1.482	0.0003650	11.046	4.152
2413.13	1.482	0.0003454	10.475	4.144
2417.80	1.482	0.0003209	9.750	4.136
2422.48	1.482	0.0002973	9.050	4.128
2427.18	1.482	0.0002724	8.309	4.120
2431.91	1.482	0.0002492	7.616	4.112
2436.65	1.482	0.0002362	7.233	4.104
2441.41	1.482	0.0002273	6.974	4.096
2446.18	1.482	0.0002225	6.839	4.088
2450.98	1.482	0.0002193	6.755	4.080
2455.80	1.482	0.0002163	6.675	4.072
2460.63	1.482	0.0002150	6.648	4.064
2465.48	1.482	0.0002120	6.568	4.056
2470.36	1.482	0.0002102	6.527	4.048
2475.25	1.482	0.0002102	6.540	4.040
2480.16	1.482	0.0002096	6.531	4.032
2485.09	1.482	0.0002080	6.497	4.024
2490.04	1.482	0.0002032	6.359	4.016
2495.01	1.482	0.0001995	6.254	4.008
2500.00	1.482	0.0001960	6.156	4.000
2505.01	1.482	0.0001913	6.022	3.992
2510.04	1.482	0.0001863	5.877	3.984
2515.09	1.482	0.0001860	5.878	3.976
2520.16	1.482	0.0001869	5.920	3.968
2525.25	1.482	0.0001901	6.032	3.960
2530.36	1.482	0.0001901	6.046	3.952
2535.50	1.482	0.0001911	6.088	3.944
2540.65	1.482	0.0001929	6.160	3.936
2545.83	1.482	0.0001960	6.271	3.928
2551.02	1.482	0.0002070	6.637	3.920
2556.24	1.482	0.0002255	7.245	3.912
2561.48	1.482	0.0002485	7.999	3.904
2566.74	1.482	0.0002810	9.063	3.896
2572.02	1.482	0.0003160	10.214	3.888
2577.32	1.482	0.0003414	11.059	3.880
2582.65	1.482	0.0003533	11.467	3.872
2587.99	1.482	0.0003510	11.414	3.864
2593.36	1.482	0.0003406	11.101	3.856

TOLUENE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
2598.75	1.482	0.0003227	10.537	3.848
2604.17	1.482	0.0003008	9.844	3.840
2609.60	1.482	0.0002795	9.165	3.832
2615.06	1.483	0.0002667	8.764	3.824
2620.55	1.483	0.0002542	8.370	3.816
2626.05	1.483	0.0002410	7.953	3.808
2631.58	1.483	0.0002292	7.580	3.800
2637.13	1.483	0.0002184	7.236	3.792
2642.71	1.483	0.0002103	6.985	3.784
2648.31	1.483	0.0002024	6.737	3.776
2653.93	1.483	0.0001928	6.429	3.768
2659.57	1.483	0.0001887	6.307	3.760
2665.25	1.483	0.0001882	6.304	3.752
2670.94	1.483	0.0001880	6.309	3.744
2676.66	1.483	0.0001869	6.288	3.736
2682.40	1.483	0.0001863	6.280	3.728
2688.17	1.483	0.0002065	6.975	3.720
2693.97	1.483	0.0002409	8.157	3.712
2699.78	1.483	0.0002799	9.496	3.704
2705.63	1.483	0.0003323	11.297	3.696
2711.50	1.483	0.0003957	13.483	3.688
2717.39	1.483	0.0004591	15.678	3.680
2723.31	1.484	0.0004982	17.049	3.672
2729.26	1.484	0.0005051	17.322	3.664
2735.23	1.484	0.0004808	16.525	3.656
2741.23	1.484	0.0004472	15.405	3.648
2747.25	1.484	0.0004161	14.364	3.640
2753.30	1.484	0.0003951	13.669	3.632
2759.38	1.484	0.0003903	13.535	3.624
2765.49	1.484	0.0004040	14.041	3.616
2771.62	1.484	0.0004278	14.899	3.608
2777.78	1.484	0.0004677	16.327	3.600
2790.18	1.485	0.0005083	17.823	3.584
2796.42	1.485	0.0006051	21.262	3.576
2802.69	1.485	0.0007511	26.453	3.568
2808.99	1.485	0.0009289	32.788	3.560
2815.32	1.485	0.0011695	41.376	3.552
2821.67	1.485	0.0014068	49.881	3.544
2828.05	1.486	0.0017314	61.531	3.536
2834.47	1.486	0.0021367	76.108	3.528
2840.91	1.485	0.0026018	92.883	3.520
2847.38	1.485	0.0016465	58.914	3.512
2853.88	1.486	0.0022895	82.107	3.504
2860.41	1.485	0.0026611	95.655	3.496
2866.97	1.485	0.0026756	96.393	3.488
2873.56	1.485	0.0027015	97.552	3.480
2880.18	1.485	0.0026972	97.620	3.472
2886.84	1.486	0.0027943	101.370	3.464
2893.52	1.486	0.0031828	115.729	3.456
2900.23	1.486	0.0038698	141.035	3.448
2906.98	1.486	0.0045588	166.533	3.440
2913.75	1.486	0.0052927	193.792	3.432
2920.56	1.486	0.0056591	207.692	3.424
2927.40	1.485	0.0059888	220.307	3.416
2934.27	1.484	0.0059257	218.501	3.408
2941.18	1.484	0.0058384	215.787	3.400

TOLUENE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
2948.11	1.484	0.0056867	210.674	3.392
2955.08	1.483	0.0052863	196.303	3.384
2962.09	1.483	0.0051406	191.349	3.376
2969.12	1.484	0.0049825	185.904	3.368
2976.19	1.484	0.0050313	188.169	3.360
2983.29	1.484	0.0053165	199.311	3.352
2990.43	1.485	0.0058880	221.264	3.344
2997.60	1.485	0.0066955	252.212	3.336
3004.81	1.484	0.0075893	286.570	3.328
3012.05	1.484	0.0087047	329.478	3.320
3019.32	1.483	0.0094100	357.033	3.312
3026.63	1.481	0.0095946	364.918	3.304
3033.98	1.480	0.0095872	365.523	3.296
3041.36	1.479	0.0093586	357.675	3.288
3048.78	1.478	0.0088052	337.347	3.280
3056.24	1.477	0.0078674	302.154	3.272
3063.73	1.476	0.0069090	265.996	3.264
3071.25	1.475	0.0059541	229.795	3.256
3078.82	1.475	0.0046322	179.218	3.248
3086.42	1.475	0.0035125	136.232	3.240
3094.06	1.475	0.0019902	77.380	3.232
3101.74	1.476	0.0015418	60.094	3.224
3109.45	1.477	0.0011717	45.785	3.216
3117.21	1.477	0.0008717	34.147	3.208
3125.00	1.477	0.0006860	26.937	3.200
3132.83	1.478	0.0005194	20.447	3.192
3140.70	1.478	0.0004438	17.515	3.184
3148.62	1.478	0.0003984	15.765	3.176
3156.57	1.479	0.0003458	13.717	3.168
3164.56	1.479	0.0003047	12.119	3.160
3172.59	1.479	0.0002654	10.581	3.152
3180.66	1.479	0.0002338	9.346	3.144
3188.78	1.479	0.0002070	8.296	3.136
3196.93	1.479	0.0001811	7.274	3.128
3205.13	1.480	0.0001612	6.492	3.120
3213.37	1.480	0.0001447	5.843	3.112
3221.65	1.480	0.0001305	5.283	3.104
3229.97	1.480	0.0001227	4.979	3.096
3238.34	1.480	0.0001142	4.647	3.088
3246.75	1.480	0.0001098	4.481	3.080
3255.21	1.480	0.0001032	4.220	3.072
3263.71	1.480	0.0001027	4.211	3.064
3272.25	1.480	0.0000961	3.950	3.056
3280.84	1.480	0.0000943	3.887	3.048
3289.47	1.480	0.0000910	3.763	3.040
3298.15	1.481	0.0000880	3.647	3.032
3306.88	1.481	0.0000835	3.469	3.024
3315.65	1.481	0.0000814	3.390	3.016
3324.47	1.481	0.0000762	3.182	3.008
3333.33	1.481	0.0000747	3.128	3.000
3342.25	1.481	0.0000715	3.003	2.992
3351.21	1.481	0.0000706	2.973	2.984
3360.22	1.481	0.0000687	2.900	2.976
3369.27	1.481	0.0000697	2.952	2.968
3378.38	1.481	0.0000692	2.938	2.960
3387.53	1.481	0.0000676	2.878	2.952

TOLUENE

frequency cm^{-1}	n	k	alpha cm^{-1}	wavelength microns
3396.74	1.481	0.0000676	2.885	2.944
3406.00	1.481	0.0000656	2.806	2.936
3415.30	1.481	0.0000642	2.756	2.928
3531.07	1.482	0.0000591	2.624	2.832
3541.08	1.482	0.0000629	2.799	2.824
3551.14	1.482	0.0000697	3.113	2.816
3561.25	1.482	0.0000760	3.402	2.808
3571.43	1.482	0.0000845	3.792	2.800
3581.66	1.482	0.0000950	4.274	2.792
3591.95	1.482	0.0001070	4.828	2.784
3602.31	1.482	0.0001210	5.477	2.776
3612.72	1.482	0.0001307	5.933	2.768
3623.19	1.482	0.0001392	6.339	2.760
3633.72	1.482	0.0001426	6.511	2.752
3644.32	1.482	0.0001425	6.527	2.744
3654.97	1.482	0.0001371	6.295	2.736
3665.69	1.482	0.0001306	6.017	2.728
3676.47	1.482	0.0001226	5.665	2.720
3687.32	1.482	0.0001150	5.330	2.712
3698.23	1.482	0.0001095	5.087	2.704
3709.20	1.482	0.0001046	4.876	2.696
3720.24	1.482	0.0001044	4.882	2.688
3731.34	1.482	0.0001040	4.876	2.680
3742.52	1.482	0.0001081	5.083	2.672
3753.75	1.482	0.0001161	5.476	2.664
3765.06	1.482	0.0001227	5.803	2.656
3776.44	1.482	0.0001347	6.394	2.648
3787.88	1.482	0.0001457	6.934	2.640
3799.39	1.482	0.0001576	7.526	2.632
3810.98	1.482	0.0001735	8.311	2.624
3822.63	1.482	0.0001812	8.705	2.616
3834.36	1.482	0.0001883	9.072	2.608
3846.15	1.482	0.0001920	9.282	2.600
3858.03	1.482	0.0001904	9.229	2.592
3869.97	1.482	0.0001953	9.497	2.584
3881.99	1.482	0.0001880	9.172	2.576
3894.08	1.482	0.0001884	9.218	2.568
3906.25	1.482	0.0001879	9.223	2.560
4059.12	1.482	0.0006920	35.297	2.464
4174.64	1.482	0.0001838	9.644	2.395
4247.17	1.482	0.0003318	17.707	2.355
4347.88	1.482	0.0002890	15.789	2.300
4400.05	1.482	0.0001895	10.476	2.273
4480.70	1.483	0.0000681	3.836	2.232
4564.36	1.483	0.0001826	10.476	2.191
4621.88	1.483	0.0002401	13.946	2.164
4867.27	1.483	0.0000109	0.667	2.055
5000.00	1.483	0.0000106	0.667	2.000

BIBLIOGRAPHY

1. Drallmeier, J.A., "Hydrocarbon-vapor Measurements in Pulsed Fuel Sprays," *Applied Optics*, Vol. 33, No. 33, pp. 7781-7179, 1994.

2. Drallmeier, J.A., "Hydrocarbon Vapor Measurements in Fuel Sprays: A Simplification of the Infrared Extinction Technique," *Applied Optics*, Vol. 33, No. 30, pp. 7175-7179, 1994.

3. Billings, T.P., and Drallmeier, J.A., "A Detailed Assessment of the Infrared Extinction Technique for Hydrocarbon Vapor Measurements in a Controlled Two-Phase Flow," *Atomization and Sprays*, Vol. 4, pp. 99-121, 1994.

4. Luke, K.A., "Investigating the Impact of Ambient Pressure, Air-Assist, and Fuel Volatility on a Fuel Spray Using a Two Wavelength Laser Extinction Technique," Thesis, University of Missouri-Rolla, 1999.

5. Drallmeier, J.A. and Peters, J.E., "Optical Constants of Liquid Iso-Octane at 3.39 μm," *Applied Optics*, Vol. 29, No. 7, pp.1040-1045, 1990.

6. Alexander, D.R., Kalwala, R., Kubik, R.D., and Schaub, S.A., "Complex index of Refraction Measurements for RP-1 Liquid Rocket Fuel," *Optical Engineering*, Vol. 34, No. 3, pp.913-921, 1995.

7. Dobrowolski, J.A., et al., "Multiple Determination of the Optical Constants of Thin Film Coating Materials," *Applied Optics*, Vol. 23, No. 20, pp.3571-3596, 1984.

8. Palik, E.D., ed., Handbook of Optical Constants of Solids II, New York: Academic Press, Inc., 1991.

9. Macleod, H.A., Thin-Film Optical Filters, 2nd ed., New York: McGraw-Hill Publishing Company, 1989.

10. Irvine, W.M., and Pollack, J.B., "Infrared Optical Properties of Water and Ice Spheres," *Icarus*, Vol. 8, pp. 324-360, 1968.

11. Bertie, J.E., Labbe, H.J., and Whalley, E., "Absorptivity of Ice in the Range of 4000-30 cm^{-1}," *The Journal of Chemical Physics*, Vol. 50, No. 10, pp. 4501-4520, 1969.

12. Downing, H.D., and Williams, D., "Optical Constants of Water in the Infrared," *Journal of Geophysical Research*, Vol. 80, No. 12, pp. 1656-1661, 1975.

13. Robertson, C.W., Downing, H.D., Curnutte, B., Williams, D., "Optical Constants of Solid Ammonia in the Infrared," *Journal of the Optical Society of America*, Vol. 65, No. 4, pp. 432-435, 1975.

14. Roux, J.A. and Wood, B.E., "Infrared Optical Properties of Solid Monomethyl Hydrazine, N_2O_4, and N_2H_4 at Cryogenic Temperatures," *Journal of the Optical Society of America*, Vol. 73, No. 9, pp. 1181-1188, 1983.

15. Wood, B.E., and Roux, J.A., Infrared Optical Properties of Thin H_2O, NH_3, and CO_2 Cryofilms," *Journal of the Optical Society of America*, Vol. 72, No. 6, pp. 720-728, 1982.

16. Draegert, D.A., Stone, N.W.B., Curnutte, B., and Williams, D., "Far-Infrared Spectrum of Liquid Water," *Journal of the Optical Society of America*, Vol. 56, No. 1, pp. 64-69, 1966.

17. Robertson, C.W. and Williams, D., "Lambert Absorption Coefficients of Water in the Infrared," *Journal of the Optical Society of America*, Vol. 61, No. 10, pp. 1316-1320, 1971.

18. Palmer, K.F. and Williams, D., "Optical Properties of Water in the Near Infrared," *Journal of the Optical Society of America*, Vol. 64, No. 8, pp. 1107-1110, 1974.

19. Rusk, A.N.,Williams, D., and Querry, M.R., "Optical Constants of Water in the Infrared," *Journal of the Optical Society of America*, Vol. 61, No. 7, pp. 895-903, 1971.

20. Querry, M.R., Curnutte, B., and Williams, D., "Refractive Index of Water in the Infrared," *Journal of the Optical Society of America*, Vol. 59, No. 10, pp. 1299-1305, 1969.

21. Segelstein, D.J., "The Complex Refractive Index of Water," Thesis, University of Missouri-Kansas City, 1981.

22. Arfken, G.B. and Weber, H.J., Mathematical Methods for Physicists, 4th ed., New York: Academic Press, Inc., 1995.

23. Wooten, F., Optical Properties of Solids, New York: Academic Press, Inc., 1972.

24. Tucker, E.O., "Infrared Signatures of Jet Engine Exhaust Plumes," Thesis, University of Missouri-Rolla, 1985.

25. Newquist, L.A, "The Optical Properties of Liquids, Metals, and Minerals in the Infrared," Dissertation, University of Missouri-Rolla, 1990.

26. Churchill, R.V., Introduction to Complex Variables and Applications, New York: McGraw-Hill Book Company, Inc., 1948

27. Beyer, W.H., ed., CRC Standard Mathematical Tables, 26th ed., Boca Raton: CRC Press, Inc., 1981.

28. Berreman, D.W., "Kramers-Kronig Analysis of Reflectance Measured at Oblique Incidence," *Applied Optics*, Vol. 6, No. 9, pp. 1519-1521, 1967.

29. Ahrenkiel, R.K., "Modified Kramers-Kronig Analysis of Optical Spectra," *Journal of the Optical Society of America*, Vol. 61, No. 12, pp. 1651-1655, 1971.

30. Khanna, R.K., Ospina, M.J., and Zhao, G., "Infrared Band Extinctions and Complex Refractive Indices of Crystalline C_2H_2 and C_4H_2," *Icarus*, Vol. 73, pp. 527-535, 1988.

31. Buffeteau, T. and Desbat, B., "Thin-Film Optical Constants Determined from Infrared Reflectance and Transmittance Measurements," *Applied Spectroscopy*, Vol. 43, No. 6, pp.1027-1032, 1989.

32. Ghosal, S., Ebert, J.L., and Self, S.A., "The infrared Refractive Indices of $CHBr_3$, CCl_4 and CS_2," *Infrared Physics*, Vol. 34, No. 6, pp. 621-628, 1993.

33. Palmer, K.F., Williams, M.Z., and Budde, B.A., "Multiply Subtractive Kramers-Kronig Analysis of Optical Data," *Applied Optics*, Vol. 37, No. 13, pp. 2660-2673, 1998.

34. American Petroleum Institute, "American Petroleum Institute Research Project 44 Infrared Spectral Data," Contributed by the U.S. Naval Research Laboratory, 2,2,4-Trimethylpentane Liquid, Serial Nos. 577 and 589, 1947.

35. American Petroleum Institute, "American Petroleum Institute Research Project 44 Infrared Spectral Data," Contributed by the Universal Oil Products Company, 2,2,4-Trimethylpentane Liquid, Serial No. 251, 1945.

36. American Petroleum Institute, "American Petroleum Institute Research Project 44 Infrared Spectral Data," Contributed by the U.S. Naval Research Laboratory, n-Heptane Liquid, Serial No. 387, 1946.

37. American Petroleum Institute, "American Petroleum Institute Research Project 44 Infrared Spectral Data," Contributed by the Texas Company,n-Heptane Liquid, Serial Nos. 637 and 638, 1947.

38. American Petroleum Institute, "American Petroleum Institute Research Project 44 Infrared Spectral Data," Contributed by the U.S. Naval Research Laboratory, n-Nonane Liquid, Serial No. 389, 1946.

39. American Petroleum Institute, "American Petroleum Institute Research Project 44 Infrared Spectral Data," Contributed by the U.S. Naval Research Laboratory, n-Decane Liquid, Serial No. 390, 1946.

40. American Petroleum Institute, "American Petroleum Institute Research Project 44 Infrared Spectral Data," Contributed by the U.S. Naval Research Laboratory, 1-Hexene Liquid, Serial Nos. 472, 491, 719, 724, 1946 and 1948.

41. American Petroleum Institute, "American Petroleum Institute Research Project 44 Ultraviolet Spectral Data," Contributed by the Shell Development Company, 1-Hexene Liquid, Serial No. 563, 1954.

42. American Petroleum Institute, "American Petroleum Institute Research Project 44 Infrared Spectral Data," Contributed by the Universal Oil Company, n-Hexane Liquid, Serial No. 242, 1945.

43. American Petroleum Institute, "American Petroleum Institute Research Project 44 Infrared Spectral Data," Contributed by the U.S. Naval Research Laboratory, n-Hexane Liquid, Serial No. 386, 1946.

44. American Petroleum Institute, "American Petroleum Institute Research Project 44 Infrared Spectral Data," Contributed by the Texas Company, New York, n-Hexane Liquid, Serial Nos. 802 and 803, 1949.

45. American Petroleum Institute, "American Petroleum Institute Research Project 44 Infrared Spectral Data," Contributed by the U.S. Naval Research Laboratory, o-Xylene Liquid, Serial No. 310, 1945.

46. American Petroleum Institute, "American Petroleum Institute Research Project 44 Ultraviolet Spectral Data," Contributed by the U.S. Naval Research Laboratory, o-Xylene Liquid, Serial No. 14, 1945.

47. American Petroleum Institute, "American Petroleum Institute Research Project 44 Ultraviolet Spectral Data," Contributed by the Shell Development Company, o-Xylene Liquid, Serial No. 43, 1945.

48. American Petroleum Institute, "American Petroleum Institute Research Project 44 Ultraviolet Spectral Data," Contributed by the Texas Company, o-Xylene Liquid, Serial No. 55, 1945.

49. American Petroleum Institute, "American Petroleum Institute Research Project 44 Ultraviolet Spectral Data," Contributed by the University of Chicago Physics Department, o-Xylene Liquid, Serial No. 173, 1947.

50. American Petroleum Institute, "American Petroleum Institute Research Project 44 Infrared Spectral Data," Contributed by the U.S. Naval Research Laboratory, Toluene Liquid, Serial Nos. 308 and 480, 1945 and 1946.

51. American Petroleum Institute, "American Petroleum Institute Research Project 44 Infrared Spectral Data," Contributed by the Socony-Vacuum Laboratories, Toluene Liquid, Serial No. 1704, 1955.

52. American Petroleum Institute, "American Petroleum Institute Research Project 44 Infrared Spectral Data," Contributed by the Union Oil Company of California, Toluene Liquid, Serial No. 1770, 1956.

53. American Petroleum Institute, "American Petroleum Institute Research Project 44 Ultraviolet Spectral Data," Contributed by the Texas Company, Toluene Liquid, Serial No. 2, 1945.

54. American Petroleum Institute, "American Petroleum Institute Research Project 44 Ultraviolet Spectral Data," Contributed by the U.S. Naval Laboratory, Toluene Liquid, Serial No. 12, 1945.

55. American Petroleum Institute, "American Petroleum Institute Research Project 44 Ultraviolet Spectral Data," Contributed by the Ethyl Corporation, Toluene Liquid, Serial No. 19, 1945.

56. American Petroleum Institute, "American Petroleum Institute Research Project 44 Ultraviolet Spectral Data," Contributed by the Union Oil Company of California, Toluene Liquid, Serial No. 27, 1945.

57. American Petroleum Institute, "American Petroleum Institute Research Project 44 Selected Properties of Hydrocarbons and Related Compounds," edited by the Carnegie Institute of Technology, 1966.

58. Bellamy, L.J., The Infrared Spectra of Complex Molecules, 3rd Ed., New York: John Wiley & Sons, 1975.

59. Clark, B.J., Frost, C.T., and Russell. M.A., ed., UV Spectroscopy: techniques instrumentation, data handling, New York: Chapman & Hall, 1993.

60. Alpert, N.L., Keiser, W.E., and Szymanski, H.A., IR: Theory and Practice of Infrared Spectroscopy, 2nd ed., New York: Plenum Press, 1970.

61. Robertson, C.W., Curnutte, B., and Williams, D., "The Infrared Spectrum of Water," *Molecular Physics*, Vol. 26, No. 1, pp. 183-191, 1973.

62. Zolotarev, V.M., Mikhailov, B.A., Alperovich, L.I., and Popov, S.I., "Dispersion and Absorption of Liquid Water in the Infrared and Radio Regions of the Spectrum," *Optka I Specroskopija*, Vol. 27, 1969. (English translation in *Optics and Spectroscopy*, Vol. 27, pp. 430-432, 1969.)